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RAILWAY MECHANICAL ENGINEER

Research and Design of Modern

Steam Passenger Locomotives*

Part I

By P. W. Kiefer†

The development of passenger locomotives on the New York Central showing the methods used to satisfy the continued demands for increased power

In recent years, much valuable information and data on the modern steam locomotive, its elements and adjuncts, have been published or otherwise made available by many eminent engineers interested in railroad motive power. As a result of these painstaking efforts, the subject as a whole and the factors into which it subdivides have been particularly well covered. Nevertheless, when dealing with the subject of motive power from the standpoint of meeting the constantly changing needs of the modern railroad, even over a relatively short period of time, it soon becomes evident that the problems to be faced and solved are both complex and numerous and usually urgent.

With these circumstances indicated, it will be the author's main purpose to review the practical aspects of the problems which have been involved in supplying high-capacity steam motive power for fast and heavy service on the New York Central during the last 15 years; to recite the several design and performance objectives, as determined in advance for this motive power; to submit information indicating the extent to which these objectives have been attained, as checked through performance tests under regular passenger-train operating conditions; and, finally, to express some thoughts on trends for the near future in design improvement.

While many of the problems confronted are similar to those encountered on other large railroads and the solutions in a number of respects are alike, it is desired to discuss specific matters which can be directly handled and to avoid the use of generalities so far as practicable. For these reasons, the content of this paper has been confined to the motive power of the New York Central.

It is not the intention to detail the features of the motive-power units here included but instead to limit the descriptive matter to major characteristics of design, supplemented in some instances by reference to special equipment items and to avoid, as far as practicable, repetition of what is already well known or is readily procurable from various sources.

Historical Background

In 1904, when the Consolidation, Ten-Wheeler, Atlantic, and Prairie types were still the conventional freight and passenger locomotives in common use for heavy duty on the New York Central, the first of a series of Pacific type locomotives, Class K-80, was introduced on the Michigan Central. During the following year, passenger locomotives of the same type were placed in service on the Boston & Albany and on the Cleveland, Cincinnati, Chicago & St. Louis. In 1907, the New York Central and the Lake Shore and Michigan Southern, now New York Central Lines West, received modifications of this type in the form of somewhat larger locomotives, designated as Class K-2.

These engines successfully handled the work assigned to them and succeeding lots of the same type were installed until 1911, when a somewhat heavier and more powerful Pacific type was produced. This design is known as the Class K-3, a considerable number of which are still in active service.

Continuing Demand for Increased Power

Shortly after the introduction of the last of the K-3 class, it became evident that a further substantial increase in power was required and an attempt was made to meet this demand by a yet larger Pacific, having 25-in. by 28-in. cylinders instead of 23½-in. by 26-in., and with firebox and boiler capacity increased proportionately. With 79-in. driving wheels and a working boiler pressure of 200 lb. per sq. in., these locomotives developed a rated tractive force of 37,650 lb. which, by the use of a booster, was increased to 47,350 lb. This design was designated as Class K-5, and, in view of its increased size, hand firing was no longer practicable for capacity operation, so mechanical stokers were installed.

The progressive development of the Pacific type from the original Class K-80 on the Michigan Central, built in 1904, to the latest Class K-5, built in 1926, is shown in Table I, the principal characteristics of each typical design being indicated. Fig. 1 shows the drawbar pull and drawbar horsepower versus speed for each of these distinct designs, the curves being typical of actual performance on the road under regular operation with locomotives in good condition.

The K-5 class, built in 1925 and 1926, was supplied with a tender carrying 15,000 gallons of water on six-wheel trucks, which marked the introduction of the large-capacity tender for New York Central passenger

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Table I—Progressive Development of the New York Central Pacific- and Hudson - Type Locomotives

Class	K-80	K-2a	K-3q	K-3r	K-5b	J-1e	J-3a
Type	4-6-2	4-6-2	4-6-2	4-6-2	4-6-2	4-6-4	4-6-4
Year built	1904	1907	1923	1925	1926	1931	1937
Cylinders, number, diameter and stroke, in.	2—22 x 26	2—22 x 28	2—23½ x 26	2—24 x 26	2—25 x 28	2—25 x 28	2—22½ x 29
Wheels, diameter outside tires, in.:							
Driving	75	79	79	79	79	79	79
Max. tractive force, engine, lb.	28,500	29,160	30,900	32,200	37,650	42,360	43,440
Max. tractive force, booster, lb.	......	......	9,700	9,700	9,700	10,900	12,100
Weights in working order, lb.:							
On drivers	142,500	173,000	194,500	169,000	185,000	190,700	201,500
Total engine	224,000	268,000	295,500	278,000	302,000	358,600	385,100
Tender:							
Water capacity, gal.	6,000	7,500	8,000	10,900	15,000	15,000	14,000
Fuel capacity, tons	14	12	12	16½	16	24	30
Trucks	4-wheel	4-wheel	4-wheel	4-wheel	6-wheel	6-wheel	6-wheel
Boiler:							
Steam pressure, lb. per sq. in.	200	200	200	200	200	225	275
Diameter, first ring, inside, in.	70⅝	70⅝	70⅝	70⅝	79½	82 7/16	80⅝
Diameter, largest outside, in.	75 1/16	83	83	83	84	87⅝	91½
Grate area, sq. ft.	50.2	56.5	56.5	56.7	67.8	81.5	82.0
Heating surfaces, sq. ft.:							
Evaporative	3,283	3,789	3,424	3,421	3,952	4,484	4,187
Superheating	672	724	832	839	1,150	1,951	1,745
Comb. evap. and superheat.	3,955	4,513	4,256	4,260	5,102	6,435	5,932
Wheel bases, ft.-in.:							
Driving	13—0	14—0	14—0	13—8	13—8	14—0	14—0
Engine, total	33—7½	36—6	36—6	36—5	36—11	40—4	40—4
Horsepower:							
Max. indicated	1,700 at 39 m.p.h.	2,000 at 45 m.p.h.	2,100 at 45 m.p.h.	2,140 at 45 m.p.h.	3,200 at 54 m.p.h.	3,900 at 67 m.p.h.	4,725 at 75 m.p.h.
Max. drawbar	1,430 at 35 m.p.h.	1,655 at 40 m.p.h.	1,720 at 40 m.p.h.	1,750 at 40 m.p.h.	2,530 at 45 m.p.h.	3,240 at 58 m.p.h.	3,880 at 65 m.p.h.

operation, the progressive elimination of service stops, and the extension of locomotive runs.

A survey undertaken in 1926 of the facts and conditions as related to the necessity for a further increase in the power of mainline passenger locomotives, together with consideration of probable future needs, led quickly to the definite conclusion that a unit of an entirely new design and type must be developed.

A New Type Locomotive

The basic problem presented was to create a design of locomotive having the following characteristics, as compared with the Pacific types heretofore used: (1) Somewhat greater starting tractive force with increased horsepower capacity and maximum output at much higher speed; (2) boiler of ample sustained capacity to satisfy the cylinder requirements for maximum power development, under severe weather and other conditions; (3) weight distribution, wheel loads, and counterbalance to be such that impact forces and rail stresses could be confined to lower limits than heretofore observed, thus contributing to higher standards of track maintenance and obtaining better train riding characteristics; (4) increased thermal efficiency; (5) clearances to permit operation without restriction; (6) symmetrical appearance with smooth lines, free from the effects of miscellaneous appliances, piping, and other details and, (7) a high degree of reliability for uninterrupted service under conditions of dense traffic, especially on the eastern section, requiring relatively simple but adequate machinery, combined with the use of well proved auxiliary equipment, such as feedwater heaters and mechanical stokers.

After the preparation of several preliminary designs, in which the American Locomotive Company, the Superheater Company, and others cooperated to the fullest extent, the conclusion was reached that the objectives could be most efficiently attained by using a 4-6-4 wheel arrangement which would satisfy the requirements for capacity and weight and avoid the addition of a fourth pair of driving wheels, with a resultant increase in size, weight, and first cost, as well as higher maintenance costs.

This arrangement represented the first locomotive having six driving wheels built with four-wheel leading and trailing trucks for service in America.

To meet the demand for exceptional steaming capacity at sustained high speed with heavy load, the size and proportions of the boiler were given first consideration, ample heating surfaces being essential, with extra-large superheater and a grate area sufficient to insure an economical rate of firing under maximum conditions of steam generation. To carry the added weight thus imposed on the rear of the locomotive, without excessive loads on trailing or coupled axles, the four-wheel trailing truck was used, thus securing the advantage of providing for large firebox capacity with comparatively light individual axle loads and consequent low rail stresses. The boiler as finally designed had the following general dimensions and proportions:

Boiler:	
Firebox, length, in.	130
Firebox, width, in.	90¼
Volume of firebox, cu. ft.	428
Diameter of boiler at smokebox, in.	82 7/16
Diameter of boiler at back tube sheet, in.	87⅝
Tubes, number and diameter, in.	201-3½
Flues, number and diameter, in.	37-2¼
Length over tube sheets, ft.-in.	20-6
Net gas area through tubes and flues, sq. ft.	9.67
Grate area, sq. ft.	81.50
Heating surfaces, sq. ft.:	
Tubes and flues	4,203
Firebox	281
Evaporative, Total	4,484
Superheating (Type E)	1,951
Comb. evap. and Superheat.	6,435

In developing the boiler design, the provision of a combustion chamber was carefully considered but, because of serious difficulties then being experienced with riveted-seam construction, it was finally omitted.

To reduce the pressure drop and other losses and to provide for more efficient use of the steam in the cylinders, the steam and exhaust passages were enlarged, as compared with the K-5 Pacific type, and a front-end throttle was installed. A large-volume steam chest with 14-in. valves, similar to those of the K-5 class, was retained.

Other special features included air compressors mounted on the front deck for improved weight distribution and, for the first time, a specially designed cast-steel pilot and drop coupler, providing a surface free from the projection of coupler and pocket for

clearing effectively possible obstructions on the right of way. The centrifugal-type boiler feed pump was first introduced on this design with the heater located in a recessed portion of the smokebox top and a large portion of the piping placed under the jacket. Careful attention was given to the arrangement of controls and gages in the cab for convenient access and clear vision.

Table I also shows the principal dimensions and weights for the Class J-1e which are the same as those finally determined for the first sample J-1a, No. 5200,* built in 1927, except that the weight on drivers was 182,000 lb. and total engine weight was 343,000 lb. A tender with four-wheel trucks was used with this first engine having a capacity of 10,000 gallons of water and 18 tons of coal.

From 1927 to 1931, a total of 205 of these locomotives, designated as the Hudson type, were received and placed in service.

Subsequently, all of the J-1 class were dynamically counterbalanced to provide smoother operation and to permit the use of shorter running cut-off, as well as to improve the track effects. Roller bearings were installed

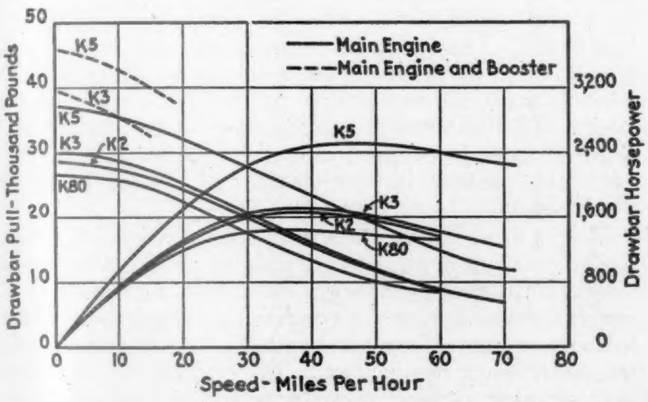


Fig. 1—Drawbar pull and horsepower vs. speed—Class K locomotives

on all engine and tender trucks and to the driving wheels of eight locomotives. All engines received speed recorders, later augmented by cut-off selection equipment.

Cast-steel beds with integral cylinders were applied, the engines already being equipped with one-piece cast-steel tender frames, engine-truck, trailer-truck, and tender-truck frames. The substitution of integral construction for the multiple-bolted parts of earlier locomotives eliminated a large number of bolts and contributed to increased availability and continuity of operation with substantial reduction in maintenance costs.

At the end of 1940, a total of 437 locomotives of this 4-6-4 type had been placed in service in the United States and Canada, including the 275 on the New York Central. The total weight in working order for each of these locomotives ranged from 310,000 to 415,000 lb. with corresponding variations in maximum tractive force.

Performance and Capacity Tests, J-1 Hudson Type Versus K-5 Pacific Type

Class J-1a No. 5200 was subjected to complete performance and capacity tests† shortly after delivery in 1927. Because of the total engine weight being held to 343,000 lb. and the smaller and lighter tender used, this locomotive delivered a maximum drawbar horsepower of 3,300 at 58 m.p.h. However, subsequent improvements already referred to increased the weight of the Hudson-type locomotives and, consequently, the principal test results here given are for the last-built and heavier class J-1e tested in 1937.

The complete performance and capacity tests of Classes J-1e (No. 5339) and K-5b (No. 8363) were conducted under spring and summer weather conditions over the Mohawk Division of the New York Central between Albany and Syracuse, a distance of 140 miles. This division is generally representative in profile and operating characteristics of the main line between New York and Chicago with the exception of the severe though comparatively short grade westbound between Albany and West Albany, a distance of about 3 miles, where the maximum grade is 1.63 per cent on a curvature of 3½ deg. With a total rise westbound of 384 ft. in the 140-mile division over a rolling profile, the average grade is 0.05 per cent with a maximum of about 0.5 per cent for approximately 1.5 miles westbound and about 0.75 per cent for slightly over 2 miles eastbound.

All tests were made under service conditions of operation, the trains consisting of empty standard steel passenger coaches varying in number from 10 to 20 which, with a dynamometer car, provided train weights of 780 to 1,465 tons. These trains were selected as representative of normal daily operation expected of the locomotive. Average test results demonstrated that the class J-1 Hudson type surpassed all previous New York Central locomotives in maximum horsepower, coal and water consumption per horsepower, weight per horsepower, and over-all efficiency.

A comparison of the principal results obtained for a single division run with representative trains is given in Table II. It should be especially noted that, except for the maximum power characteristics which may be duplicated at will with full boiler pressure and locomotive in good condition, the results shown are on the basis of over-all averages for the complete division runs, and indicate regular daily service performance rather than maximum values for short periods or under controlled conditions for the separate items.

Table II—Comparison of Test Run for K-5 and J-1 Locomotives

	Maximum output		Improvement,
	K-5	J-1	J-1, per cent
Tractive force with booster, lb.	48,750	55,100	13.0
Main engine tractive force, lb...	40,000	45,400	13.5
Main engine drawbar pull, lb...	37,000	41,300	11.6
Cylinder horsepower	3,200	3,900	22.0
	at 54 m.p.h.	at 67 m.p.h.	24.1
Drawbar horsepower	2,530	3,240	28.1
	at 45 m.p.h.	at 58 m.p.h.	28.9
AVERAGE-PERFORMANCE DATA			
Number of cars and weight in tons	15—1,053	18—1,244	...
Average working speed, m.p.h...	51.2	55	...
Average firing rate, lb. dry coal per hr.	5,867	6,940	...
Water delivered to boiler, lb. per hr.	40,636	57,200	...
Evaporation per lb. of dry coal, lb.	6.94	8.24	18.7
Combined efficiency — boiler, feedwater heater and superheater, per cent	67.8	74.6	10.0
Steam per indicated horsepower-hour, lb.:			
Cylinders only	15.42	15.44	...
Including auxiliaries	17.00	17.28	...
Dry coal per indicated horsepower-hour, lb.:			
Cylinders only	2.22	1.94	12.6
Including auxiliaries	2.46	2.10	14.6
Coal as fired per car mile, lb...	7.22	7.03	2.6
Weight per indicated horsepower, lb.	94	90	4.3
Based on working-order weight, lb.	302,000	352,000	...

* "Hudson Type Locomotive on N. Y. C.," *Railway Mechanical Engineer*, March, 1927, pp. 139-141.

† A summary of these tests appeared on page 1420D13, June 20, 1928, issue of the Railway Age June Dailies.

Comparative curves representing the drawbar pull and drawbar horsepower versus speed are shown in Fig. 2, which also includes curves for locomotives of more recent design as discussed later. With a starting effort approximately 12 per cent greater than the K-5, increasing to 37 per cent more at a speed of 70 m. p. h., and with an increase of 28 per cent in maximum drawbar horsepower at a speed 29 per cent higher, the weight per horsepower of the J-1 Hudson type has been decreased.

The Improved Hudson Type, Class J-3

As early as 1931, when the last of the J-1 class was built, consideration was already being given to the future development of this type in anticipation of greater power demand necessitated by the constantly increasing weight of trains and shortening of schedules. In order to reduce weight and also to gain some experience in the use of alloy steel of high tensile strength, with a view toward increasing the steam pressure, three of these locomotives were equipped with nickel-steel boilers. Two of the three also had roller bearings on all wheels except on the trailing truck, and the entire lot had roller bearings on the engine truck and tender wheels.

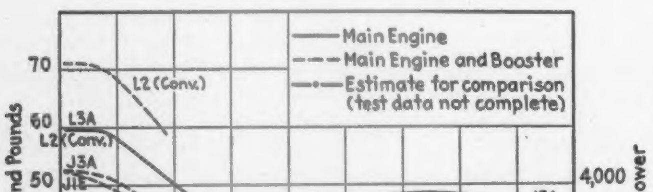


Fig. 2—Drawbar pull and horsepower vs. speed for various types of New York Central locomotives

Subsequently, one of the three, No. 5344, received lightweight roller-bearing rotating and reciprocating parts and the counter-balance was reduced proportionately, providing lower rail stresses and improved riding qualities. At this time, the boiler pressure was raised from 225 to 250 lb. per sq. in. and the cylinders were bushed to preserve the same starting tractive force and adhesion factor as on others of the same class.

As previously explained, successive lots of the J-1 class has received various improvements when built and subsequently with gradual increase in the weight of engine and tender. The weights of the original class J-1a and the latest class J-1e compare as follows:

	Original J-1a	Latest J-1e
On engine truck, lb.	63,500	65,700
On drivers, lb.	182,000	190,700
On four-wheel trailing truck, lb.	97,500	102,200
Total engine, working order, lb.	343,000	358,600
Tender, fully loaded, lb.	212,200	305,600

On the basis of the J-1 test results, the experience accumulated with the altered locomotives of this class, and other considerations, the general objectives for the new design were set as follows: (1) Maximum cylinder horsepower approximately 20 per cent greater at a much higher speed; (2) boiler pressure 275 lb. per sq. in. versus 225 lb. per sq. in.; (3) equal main-engine starting tractive force, with some additional help from booster because of increased pressure; (4) boiler and superheater proportioned for higher capacity demand and to insure ample supply of steam under all conditions; (5) approximately same over-all length and clearance limitations; (6) highest capacity tender possible within the then total length limitation, and (7) least possible increase in weight, and weight distribution no less favorable from track standpoint.

Careful study of the situation indicated that, with the utmost attention to all details of design, these objectives could be attained and still adhere to the 4-6-4 wheel arrangement rather than using another pair of driving wheels, thus effecting substantial savings in size, weight, first cost, and operating expense.

In the development of the new design, the cooperation given by The American Locomotive Company, the Superheater Company, the Timken Roller Bearing Company, and others was of the utmost value.

Fifty of these locomotives were built in the fall of 1937 and the spring of 1938,* ten of which were streamlined and five of these had roller bearings on main and side rods. The principal dimensions and proportions are shown in Table I. A large-volume steam chest with 14-inch diam. valves, similar to the J-1 class, was retained but the steam passages from dome to exhaust were enlarged in proportion to the cylinder area to provide free passage of the steam and reduce losses in transmission.

Special design and equipment features were as follows: Roller bearings applied to all wheels; reciprocating parts of special lightweight design; revolving parts reduced in weight; dynamic counterbalancing; reverse-gear cylinder located on center line of engine to assist in reducing irregularities or inequalities in valve travel due to deflection or other causes; speed recorder and cut-off selection equipment, and rubber twin-cushion double-acting draft gear at rear of tender to eliminate free slack in both directions of gear movement substituting controlled resiliency to obtain smooth and efficient operation of trains. The ten streamlined engines received tight-lock couplers. The requirements for increased cylinder power and consequent greater boiler capacity and higher working steam pressure, together with the roller-bearing equipment, improved brakes, additional sand-box capacity, and certain minor items, indicated a weight increase of about 14,750 lb. over that of the latest Class J-1e, but, as previously stated, one of the major objectives was to hold the weight as closely as possible to that of the J-1 class and to accomplish this the following features were incorporated in the design: Nickel-steel boiler-shell sheets; cast-steel unit-bar grates; high-tensile steel drop coupler; USS Cor-Ten steel main air reservoirs; aluminum cab, running boards, casings, and gage board; magnesia-block lagging of light weight; tubes and flues to close tolerance; booster exhaust piped to tender instead of to stack; integral cast-steel frames and cylinders, cradle, engine-truck and trailing-truck frames of lightened design; lightweight new-design valve gear, and lightweight reciprocating parts and alloy-steel rods which also contributed to the saving in weight.

The resulting weight reduction amounted to 13,350 lb., making the net addition only 1,400 lb. with a total weight of engine in working order of 360,000 lb., of which 201,500 lb. were placed on the drivers. With this

* "The New York Central Receives Fifty Powerful 4-6-4 Locomotives," *Railway Mechanical Engineer*, May, 1938, pp. 165-173.

Table III—Performance of J-3 Class Locomotive Compared With J-1 Class

	Maximum power J-1	Maximum power J-3	Improvement, J-3, per cent
Tractive force with booster, lb.	55,100	55,000	...
Main engine tractive force, lb...	45,400	45,000	...
Main engine drawbar pull, lb...	41,300	41,500	...
Cylinder horsepower	3,900	4,725	21.10
	at 67 m.p.h.	at 75 m.p.h.	11.90
Cylinder horsepower per pair of driving wheels	1,300	1,575	21.10
Drawbar horsepower	3,240	3,880	19.75
	at 58 m.p.h.	at 65 m.p.h.	12.10
AVERAGE PERFORMANCE, DIVISION RUN OF 140 MILES			
Number of cars and weight in tons	18—1,244	18—1,253	...
Working speed, m.p.h.	55	59	...
Firing rate, dry coal per hr., lb.	6,940	6,419	...
Water delivered to boiler per hr., lb.	57,200	54,900	...
Exaporation per pound of dry coal, lb.	8.24	8.32	1.00
Combined efficiency; boiler, feed-water heater, and superheater, per cent	74.60	76.30	2.30
Steam per indicated horsepower-hour, lb.:			
Cylinders only	15.44	14.76	4.40
Including auxiliaries	17.28	16.89	2.30
Dry coal per indicated horse power-hour, lb.:			
Cylinders only	1.94	1.84	5.15
Including auxiliaries	2.10	2.03	3.30
Coal fired per car mile, lb.....	7.03	6.21	11.70
Weight per indicated horse-power, lb.	90	76	15.50
Based on weight of engine in working order, as tested, lb.	352,000	360,000	...

total weight and the distribution obtained, together with the use of reduced-weight rotating and reciprocating parts and dynamic counterbalancing, the calculated stresses on the track structure were satisfactory and well within permissible limits.

Performance and Capacity Tests, J-3 Versus J-1

The tests of the J-3 were conducted with engine No. 5408 during the last three months of 1937, over the Mohawk Division under regular service conditions of operation, the trains consisting of 22, 17, and 10 cars, which, with the dynamometer car, furnished weights back of the tender of 1,609, 1,244, and 766 tons, or heavy, medium, and light weight trains.

The principal results of representative performance are given in Table III, the figures for the class J-1 being repeated for ready comparison.

The drawbar pull and drawbar horsepower throughout the speed range are included in Fig. 2, with other types for comparison. Fig. 3 also shows the cylinder tractive effort and horsepower for the J-3a class only.

While the same main-engine starting tractive effort has been obtained in the new design, as desired, the drawbar pull at 70 m.p.h. has increased nearly 25 per cent, and the maximum drawbar horsepower is 20 per cent greater at a speed 12 per cent higher than the J-1. Coal and steam consumption per horsepower-hour have been decreased with a reduction of 15 per cent in weight per horsepower. An average thermal efficiency of 6.06 per cent at the drawbar was obtained for a complete division run, corresponding to 9.6 per cent at the cylinder.

Thermal Efficiency at Tender Drawbar Referred to fuel

Reference to this value for the conventional-design steam locomotive usually affords an opportunity for considerable argument, although it is a fact that, during recent years, gradual improvement in this respect has been achieved.

Without questioning the fact that it is highly desirable to improve this performance characteristic, it is prudent to review some of the reasons for the relatively low thermal-efficiency value, and to consider the practical advantages inherent in this form of motive-power plant.

The conventional locomotive is a noncondensing self-contained and self-propelled unit, confined within close and definite limits of weight, height, width, and in most cases length, because of operating clearance and load limitations. The necessarily high horsepower requirement naturally is accompanied by a high combustion rate and B.t.u. heat release per cubic foot of firebox volume per hour. Furthermore, this complete power plant, including all auxiliary equipment and its own fuel and water supply, is handled successively by different crews of only two men each at high speeds in dense traffic under widely and rapidly fluctuating load requirements.

Steam-locomotive efficiency at the tender drawbar is affected by the non-power-producing wheels and by the weight carried thereby. The modern tender when fully loaded may represent the equivalent of one and a half loaded 70-ton coal cars or more. However, the hauling of this nonadhesive weight is amply justified through sustained power output and the attendant advantages obtained.

Simplification of design, particularly with respect to cylinders and valve gear, penalizes the thermal efficiency, but repayment is secured and augmented in terms of high serviceability and reasonable freedom from excessive maintenance troubles. Moderate first cost for an active motive-power unit is essential unless the net return on additional investment can be clearly established. The measure of the value of a locomotive is its use, idle motive power representing a total loss of investment and

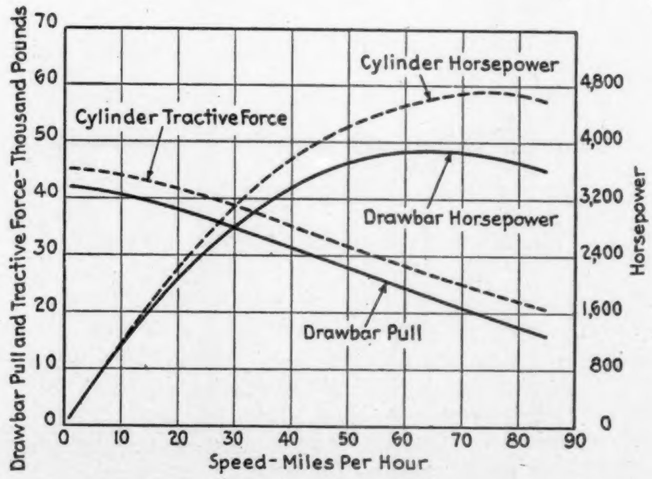
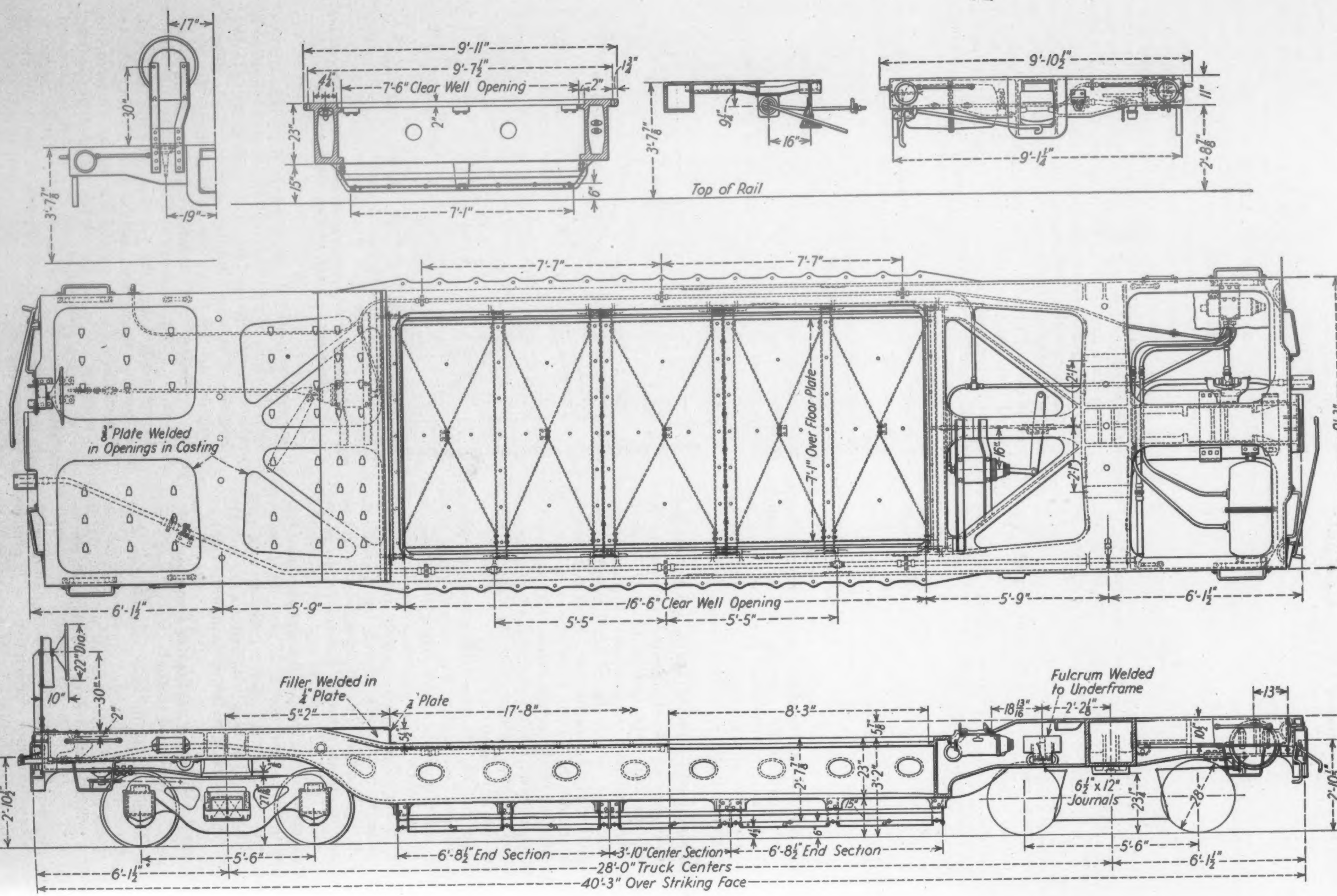


Fig. 3—Tractive force and horsepower vs. speed; and drawbar pull and horsepower vs. speed for Class J3A locomotives

a constant expense. It is currently demonstrated that economically, maximum over-all performance efficiency is secured through the use of a unit capable of providing uninterrupted service and consistently high mileage throughout its life, with the best available design of boiler, cylinder, and related parts to fulfill these conditions.

As previously noted, the J-3 class was equipped with roller bearings throughout, including the driving wheels. The possibility was recognized that forced vibrations of the unsprung mass of the closely fitted roller-bearing driving-wheel assemblies caused by the overbalance and the elastic foundation of the track structure might be sufficient during high-speed slipping to cause the wheels to lift from the rail.

(To be concluded)



Plan, elevation and cross-sections of Delaware & Hudson well-hole car

Delaware & Hudson

Well-Hole Car

These cars of 98-ton nominal capacity have Commonwealth one-piece cast-steel underframes and are designed especially for the transportation of heavy electrical equipment

THE first of five 98-ton well-hole cars being built at the Oneonta, N. Y., car shops of the Delaware & Hudson was completed and placed in service during the latter part of June. These cars were ordered to meet the demands of increased traffic and were designed especially for the transportation of heavy electrical equipment such as transformers, dynamos and generators. They have a light weight of 53,900 lb. and a load limit of 197,100 lb. The over-all length is 40 ft. 3 in. with a clear well opening 16 ft. 6 in. long and 7 ft. 6 in. wide.

The cars have Commonwealth cast-steel one-piece underframes and a steel platform at each end of the car. The platforms were formed by welding ⅜-in. plates in the casting openings flush with the top of the underframe. The sloping intersections of the platforms with the center portion of the underframe, the top of which is 5½ in. below the level of the platforms, were boxed in by welding a ¼-in. Z plate across the width of the car to support a ⅜-in. top plate. This arrangement extends the platforms an additional 23¾ in. toward the center and also encloses the brake cylinders. All brake pipes are carried through the center portion of the side-sill members which protects them from damage by the lading.

Principal Weights and Dimensions of the Delaware & Hudson Well-Hole Car

Light weight, lb.	53,900
Load Limit, lb.	197,100
Total weight at rail, lb.	251,000
Weight of underframe, lb.	26,200
Weight of one truck, lb.	10,100
Journals, ft.-in.	6½ x 12
Wheels, multiple wear steel, in.	28
Length over strikers, ft.-in.	40-3
Width over-all, ft.-in.	9-11
Well opening, width, ft.-in.	7-6
Well opening, length, ft.-in.	16-6
Well opening, depth, ft.-in.	2-7⅞
Height, rail to top of end platforms, ft.-in.	3-7⅞
Height, rail to top of side sill at well, ft.-in.	3-2

The load carried in the well opening is supported on the underframe longitudinal side-sill members. The bottom of the well is covered by steel plates as a safety measure and also as a means of protecting the lading against dirt and cinders. In the event additional clearance is required, the center sections of these protecting plates may be removed. Holes in the steel platform and the sides of the underframe at the well opening are provided for attaching the rods or cables used to hold the lading in place.

The cast-steel trucks have integral frames with 28-in. multiple-wear steel wheels and 6½-in. by 12-in. axle journals. Miner Type A-22-XB draft gears were applied to the cars. The air-brake equipment consists of two sets of AB brakes with 7½-in. by 12-in. cylinders while one Ajax geared hand brake is furnished for manual braking. Other equipment includes Creco No. 4 brake beams and four-point brake-beam supports, coil spring groups with Symington-Gould snubbers, swivel-butt rotary-operated couplers, Union centering devices and Wine brake balancers. The principal weights and dimensions are given in the table.

Locomotive Maintenance Officers' Association

Hotel Sherman, Chicago

Tuesday, September 23

Morning Session

9:30 o'clock — Joint meeting of the Coordinated Associations—Address by V. R. Hawthorne, executive vice-chairman, Mechanical Division, Association of American Railroads.

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10:30 o'clock — Report of Committee on Maintenance of Air Brake Equipment—J. P. Stewart (chairman), general supervisor air brakes, Missouri Pacific Lines.

Afternoon Session

2:00 o'clock — Report of Secretary-Treasurer

Report of Committee on Apprenticeship—Roy V. Wright (chairman), editor, *Railway Mechanical Engineer*.

Report of Committee on Constitution and By-Laws.

Election of officers.

Wednesday, September 24

Morning Session

9:00 o'clock — Report of Committee on Improved Locomotive Repair Practices—N. M. Trapnell (chairman), assistant superintendent of motive power, Chesapeake & Ohio.

Report of Committee on Shop Tools.

Afternoon Session

2:00 o'clock — Report of Committee on Lubrication—J. R. Brooks (chairman), supervisor of lubrication and supplies, C. & O.

Report of Committee on Membership.

Installation of new officers.

Remarks by retiring president.

Remarks by incoming president.

Master Boiler Makers' Association

Hotel Sherman, Chicago

Tuesday, September 23

Morning Session

8:00 o'clock	Registration*
9:30 o'clock	Joint meeting of the Coordinated Associations—Address by V. R. Hawthorne, executive vice-chairman, Mechanical Division, Association of American Railroads.

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10:45 o'clock	Opening session Master Boiler Makers' Association.
10:50 o'clock	Address by President C. B. Buffington. Secretary-Treasurer's report Report of the Committee on Law New business. Routine business

Afternoon Session

1:30 o'clock	Address by C. B. Hitch, superintendent of motive power, C. & O. Topic No. 2. Application and maintenance of flues, tubes, and arch tubes—Frank A. Longo (chairman), general boiler inspector, Southern Pacific System. Topic No. 4. Application of straight vs. tapered radial staybolts, taper per foot, taps and reamers used, and service that is being obtained, coal and oil-burning locomotives—R. W. Barrett (chairman), chief boiler inspector, Canadian National. Routine business.

Wednesday, September 24

Morning Session

8:30 o'clock	Registration.
9:00 o'clock	Routine business. Topic No. 5 (Continued from 1940). Application of iron, steel, and alloy rivets, with recommendations as to the proper methods of heating and driving—A. G. Trumbull (chairman), chief mechanical engineer, Advisory Mechanical Committee, C. & O. Topic No. 3 (Continued from 1940). Treating feed water chemically—Carl A. Harper (chairman), general boiler inspector, C.C.C. & St. L.

Afternoon Session

1:30 o'clock	Topic No. 3 continued. Topic No. 1. Shop kinks and new ways of doing things in the boiler shop—S. Christopherson (chairman), supervisor of boiler inspection and maintenance, N.Y. N.H. & H. Report of special committees. Report of Executive Committee. Report of Committee on Memorials. Report of Committee on Resolutions. Election of officers.

*Registration also Monday, 4:30 to 6:00 p. m., Rooms 1508-1510.

Car Department Officers' Association

Hotel Sherman, Chicago

Tuesday, September 23

Morning Session

8:00 o'clock	Registration.
9:30 o'clock	Joint meeting of Coordinated Associations—Address by V. R. Hawthorne, executive vice-chairman, Mechanical Division, Association of American Railroads.

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10:30 o'clock	Meeting called to order. Approval of minutes of last annual meeting. Address by President A. J. Krueger, superintendent car department, N.Y.C. & St.L. Reports of District Membership Committees. Report of Secretary-Treasurer. Unfinished business. New business.

Afternoon Session

1:30 o'clock	Report of Publicity Committee. Address by E. B. Hall, chief mechanical officer, C. & N.W. and C.St.P.M. & O. Subject: Cooperation between Railroads and Departments of Railroads. Report of Freight- and Passenger-Car Maintenance Committee—J. E. Keegan (chairman), chief car inspector, Pennsylvania. Report of Shop Operation, Facilities and Tools Committee—R. K. Betts (chairman), foreman car repairs, Pennsylvania. Report of Passenger-Train-Car Terminal Handling Committee, C. P. Nelson (chairman), general foreman, C. & N.W. Report of Lubricants and Lubrication Committee—J. R. Brooks (chairman), supervisor lubrication and supplies, C. & O.

Wednesday, September 24

Morning Session

8:00 o'clock	Address by W. D. Beck, district manager, Car Service Division, Association of American Railroads. Subject: Conservation of Equipment. Report of Freight-Car Inspection and Preparation for Commodity Loading Committee—H. E. Wagner (chairman), general car foreman, Missouri Pacific. Address by D. S. Ellis, chief mechanical officer, C. & O., Pere Marquette, and N.Y.C. & St.L. Subject: Better Freight-Car Maintenance. Report on Interchange and Billing for Car Repairs—E. G. Bishop (chairman), general foreman car department, Illinois Central.

Afternoon Session

1:30 o'clock	Report of A.A.R. Loading Rules Committee—H. T. DeVore, (chairman), chief interchange inspector, Youngstown Car Inspection Association. Report of Painting Committee—C. L. Swing (chairman), general foreman, Pullman-Standard Car Manufacturing Company. Report of Booster Committee—W. J. Demmert (chairman), sales agent, Griffin Wheel Company. Report of Reception Committee. Report of Nominating Committee. Election of officers.

Railway Fuel and Traveling Engineers' Association

Hotel Sherman, Chicago

Tuesday, September 23

Morning Session

8:00 o'clock Registration.

9:30 o'clock Joint meeting of the Coordinated Associations—Address by V. R. Hawthorne, executive vice-chairman, Mechanical Division, Association of American Railroads.

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10:30 o'clock Address by President A. A. Raymond, superintendent fuel and locomotive performance, N.Y.C.

Appointment of special committees.

Plugged netting—Cause and Cure—H. L. Malette (chairman), road foreman of equipment, St.L.—S.F.

The Road Foreman and the Diesel Locomotive—W. D. Quarles (chairman), general mechanical instructor, A.C.L.

Fuel Records and Statistics—E. E. Ramey (chairman), fuel engineer, B. & O.

Afternoon Session

2:00 o'clock Air brakes—J. A. Burke (chairman), supervisor air brakes, A.T. & S.F.

(a) High-speed breaking with D-22 control valves—H. I. Tramblie, air-brake supervisor, C.B. & Q.

(b) Terminal tests in road handling on long freight trains with mixed K and AB brake equipment—F. T. McClure, assistant air-brake supervisor, A.T. & S.F.

(c) The elimination of moisture and oil in the air-brake system—F. Ellis, general air-brake instructor, St.L.—S.F.

Wednesday, September 24

Morning Session

9:00 o'clock Locomotive performance as Affected by Steam Distribution—J. L. Ryan, mechanical engineer, St.L.—S.F.

Turbine and condensing Locomotives—L. P. Michael, (chairman), chief mechanical engineer, C. & N.W.

Address by L. Richardson, mechanical assistant to vice-president and general manager, B. & M.

Coal—Utilization of the Various Sizes—S. A. Dickson (chairman), supervisor fuel, Alton.

New Locomotive Economy Devices—A. G. Hoppe (chairman), assistant mechanical engineer, C.M.St.P. & P.

Utilization of Motive Power—A. A. Raymond (chairman), superintendent fuel and locomotive performance, N.Y.C.

Afternoon Session

2:00 o'clock Fuel Economy from the Viewpoint of the Water Engineer—R. C. Bardwell, superintendent water supply, C. & O.

Lubrication—W. R. Sugg (chairman), superintendent fuel conservation and lubrication, Missouri Pacific.

(a) Lubrication of valves, cylinders and steam auxiliaries.
(b) Forced feed and automatic lubrication of machinery.

Report of Secretary-Treasurer.

Election of Officers.

Reports of special committees.

Other business.

EDITORIALS

Cleaning Modern Streamliners

Modern streamline passenger equipment has been installed primarily to build up railway prestige and increase passenger-train earnings by providing fast and safe transportation in cars which are comfortable, convenient, pleasingly designed and decorated to a degree never before attained in railway history. Railway passenger trains are operated often, and in fact most of the time, under more or less adverse climatic and atmospheric conditions, and the most perfect cars ever built, from a mechanical standpoint, will not long prove satisfactory to passengers unless an organized program of exterior and interior cleaning is developed and conscientiously followed. It is gratifying to note that one of the important committee reports which will be presented at the September 23 to 24 meeting of the Car Department Officers' Association at Chicago, will be devoted to the maintenance of streamline equipment and include two extensive sections on exterior and interior car cleaning.

Not every one realizes how much it costs to keep modern passenger equipment, including streamline trains, clean. From a recent rather limited survey, this cost apparently averages between $3 and $5 per car for current daily cleaning. Obviously, some classes of cars cost more to clean than others and on one railroad operating stainless-steel equipment, the following average daily costs were reported: Baggage-mail car, $1.44; baggage-dinette, $3.58; 78-seat chair car, $4.32; chair-parlor car, $5.15. These figures include both labor and material and 20 per cent allowance for supervision. The average cost for exterior and interior cleaning of the four cars mentioned was $3.60 per car per day.

On another railroad using streamline passenger equipment, embodying primarily welded USS Cor-Ten steel construction, the cleaning cost per car per day was as follows: Exterior cleaning, $1.63; interior cleaning, $2.18; train supplies, $.55; cleaning materials, $0.24; or a grand total of labor and material cost of $4.60 per car per day.

On the first road mentioned, it is estimated that 75 per cent of the actual cleaning cost is chargeable to cleaning car interiors and that one-third of this amount is expended for various operations required in cleaning the upholstery in the carpets. More accurate figures on the second road show that 58 per cent of the total number of man hours required for cleaning a modern passenger train are needed to clean the car interiors. Experience on this road indicates that at least 50 per cent of the interior car cleaning cost is required for cleaning the seat upholstery and carpet. Washing constitutes by far the larger part of the exterior cleaning cost, amounting to about twice the cost of cleaning the windows, trucks, etc.

The general method of cleaning upholstery fabrics and carpets is to clear them daily of dust and dirt, mainly with an efficient vacuum cleaner, and remove any badly-soiled spots with carbon tetrachloride or the equivalent. At more or less regular periods of three to six months as required, the upholstery should be thoroughly cleaned, preferably with an efficient rug shampoo, the car being taken out of service long enough to allow for drying or else have replacement cushions and carpets available to install.

With modern streamline passenger cars intensively used on close schedules, especially during the summer rush season, the problem of getting enough time to perform necessary cleaning operations is no small one. Some railroads have found that the solution of this problem is what might be called *current maintenance,* including the use of replacement cushions and carpets to avoid taking the cars out of service for extensive cleaning operations. With a layover period of only two to three hours each day at main terminals, for example, it is entirely practicable to replace a carpet and a dozen sets of seat cushions, one or more cars being thus completely re-conditioned each week. Keeping this expensive modern equipment in revenue-earning service, without frequent shopping for repairs or heavy cleaning operations, is very much in the interests of increased railway earnings and reduced expenditures.

Scrutinizing The Scrap Pile

On page 330 appears a brief account of a conference held at Washington early in July at which OPM plans for the location and return for remelting of scrap steels containing a number of alloying elements, particularly nickel, were announced and discussed. The nickel-steel supply problem has become particularly acute. As announced at this meeting, the total demand in the United States is now running about twenty-one million pounds a month, of which about twelve and one-half million pounds are required on A priority ratings. The total available supply is fifteen million pounds per month. Facing such a situation, the logic of turning to the scrap pile is obvious.

In the production industries using nickel and other alloy-steel forgings, as much as from 20 to 40 per cent of the material is removed in machining. The preparation of these turnings for return to the steel industry

is one of the problems under study. Most of the alloy steels used by the railroads are in the form of locomotive or car forgings. They appear in the scrap pile largely in the form of heavy remelting scrap and offer no serious problem of preparation for shipment and remelting. The only problem facing the railroad is that of suitable segregation according to the amount and combination of alloying elements in the steel.

The extent to which such scrap will be returned by the railroads in suitable form to prevent the loss of the critical alloying elements will depend upon how much special effort will be justified in segregating and protecting these scraps from contamination, by the price differential which such scraps command. The possibilities for a net financial return on the operation, however, are great enough to justify a thorough study of this situation guided by the recommendations for grading which have recently been issued by the Office of Production Management.

Let's Look At the Record

Nearing completion of its fourth year of service, four-fifths of the test period prescribed by the Interstate Commerce Commission, the Delaware & Hudson's fusion welded boiler maintains unbroken its record of 100 per cent performance. With a monotonous repetition of content, the progress reports on this test have merely verified that which many have never doubted, the ability of welding to meet successfully the requirements of safe locomotive boiler construction. In approaching the last year of the test period, the performance of this boiler again focuses attention on fusion welding as a solution of many of the vexatious problems facing boiler designers and boiler maintainers alike.

A listing of these problems would be fundamentally a recitation on the limitations of riveted boiler construction. These were reviewed most forcefully by A. G. Hoppe, assistant mechanical engineer, Chicago, Milwaukee, St. Paul & Pacific at the A. A. R. Mechanical Division meeting in St. Louis in his discussion of the report on locomotive construction, which appeared in last month's issue. Of particular interest, however, was the plea made by Mr. Hoppe in concluding his discussion that there is an immediate need of utilizing welded construction for locomotive boilers. It is an indication that responsible engineers view welding as a reliable medium by which present limitations on progress in boiler construction can be removed.

At both the Mechanical Division meeting and the railroad sessions of the American Society of Mechanical Engineers, at Kansas City on June 17, James Partington, manager engineering department, American Locomotive Company, discussed the development and the advantages of welded boilers. As a member of the A. S. M. E. Boiler Code Committee of long standing and chairman of its subcommittees on Locomotive Boilers and Welding, Mr. Partington is an authority on this subject. While they may be familiar to many, his concise enumeration of the advantages obtained with the welded locomotive boiler at the A. S. M. E. meeting are well worth repeating. These are: no rivets, no overlaps, no obstruction inside or outside, no joint repairs or failures, lower maintenance expense, higher efficiency, lighter weight, easier handling, quicker washing, neater appearance, and lastly, the elimination of caustic embrittlement. The net result is a better boiler producing greater availability of the steam locomotive.

It should be noted that the active development of plans for the Delaware & Hudson's fusion welded boiler was first started in 1935. Since that year, advances in welding technique have been so great that it has been difficult for the various codes to keep pace with its rapid progress. With this additional knowledge and skill, it seems logical to expect that locomotive boilers fabricated by competent welding operators in accordance with the latest procedure and test methods would produce performance records as impressive as those of the first fusion welded locomotive boiler. What more could be expected?

Constructive Air Brake Papers Being Prepared

It is not too early for air brake supervisors generally to make plans for attending the annual meeting of the Railway Fuel and Traveling Engineers' Association which will be held at Chicago this fall. Recognizing the vital necessity of adapting air-brake performance to modern requirements and securing uniformly satisfactory brake performance, the subjects committee and officers of the association have greatly strengthened the program of the annual meeting by including air brake subjects of great interest to supervisors throughout the country and arranging to present information which these men can ill afford to miss if their respective railroads are to keep abreast of the times in braking heavy fast trains with maximum efficiency.

The air-brake subjects, scheduled for presentation this year by an unusually competent and experienced committee, are divided into three parts for the purpose of concentrating discussion on three particularly pressing current problems relating to air-brake equipment and its operation. The first subject "High-Speed Braking With D-22 Control Valves," will be presented by a railroad air-brake supervisor who has had a vast amount of experience with the braking of high-speed trains and who has co-ordinated the experience of an able subcommittee in preparing this section of the committee's report. The "Terminal Testing and Road Handling of Long Freight Trains With Mixed K and AB Equipment," is the second subject, also being prepared by a competent subcommittee under the leadership of a former road foreman of engines who is now assistant supervisor of air brakes. The "Elimination of Mois-

ture and Oil From the Air Brake System," will be presented by an experienced subcommittee under the direction of a general air brake inspector and represents the composite thought of both air-brake companies and railroad specialists.

In the absence of any national meeting of air-brake supervisors this year, it is apparent that community of interest and the possibility of exchanging experiences regarding air-brake problems of vital importance make it highly desirable for railway managements to send their air-brake supervisors to this meeting of the Railway Fuel and Traveling Engineers' Association. The details of the program for the annual meeting are shown elsewhere in this issue.

Factors in Steam Locomotive Improvement

It is a generally accepted fact that tremendous changes have been made in the steam locomotive during the past fifteen or twenty years. Just how extensive these changes have been and what they have accomplished in the way of increased capacity, increased reliability, and reduced costs of maintenance were set forth in two papers presented before the semi-annual meeting of the A. S. M. E. held at Kansas City, Mo., during June of this year. The first installment of one of these papers, by P. W. Kiefer, chief engineer motive power and rolling stock, New York Central, appears elsewhere in this issue. It will be completed in a latter issue and will be followed by an abstract of the paper by A. A. Raymond, superintendent fuel and locomotive performance, New York Central. Together, these papers constitute a remarkable record of a 15-year period of intensive study and improvement of steam passenger motive power on a single railroad and the kind of performance which can be obtained from the current designs which that effort has evolved.

Following the building of the first 4-6-4 type locomotives, Mr. Kiefer cites a steady procession of changes in the design applied successively as more of these locomotives were ordered, until a complete revision of the design produced the present J3 class, the first of which were built in 1937. These changes have contributed to reliability, economy, and capacity. They include the installation of roller bearings on all engine and tender trucks; the application of dynamic counterbalancing to reduce track effects; speed-recording and selective cut-off equipment to effect greater utilization of capacity, the installation of cast-steel engine beds to increase reliability and continuity of operation with a substantial reduction in maintenance cost; the use of nickel-steel boilers to reduce weight and permit higher boiler pressures; further improvement in counterbalancing by the use of lightweight roller-bearing reciprocating and rotating parts; the installation of roller-bearing driving boxes; enlarged steam passages in proportion to increased cylinder area, and the use of USS Cor-Ten steel and aluminum for various parts to effect further reductions in weight.

The objectives of the complete revision of the 4-6-4 type design were a 20-per cent increase in maximum drawbar horsepower at a much higher speed over the capacity of the first design of this type, which developed a maximum drawbar horsepower capacity 28 per cent higher at a speed 29 per cent above that of the last design of Pacific type on the New York Central.

How effectively the features enumerated have contributed to making these locomotives with their increased power more reliable, more capable of sustained service, and less costly to maintain is brought out in Mr. Raymond's paper in which is recorded striking reductions in engine failures and marked increases in miles per locomotive per month.

It will be noted that the developments recorded in Mr. Kiefer's paper conservatively adhere to a basic design made up of conventional elements, but that improvements and refinements in the design followed each other rapidly throughout the twelve years which elapsed between the building of the first 4-6-4 locomotive of the J1 class and the complete redesign of the type to produce the J3 class. Is there any reason to believe that the J3 class locomotives, refined as they are by comparison with their predecessors, are going to be spared the processes of change and improvement any more than their predecessors, which, in the minds of their designers, at least, were obsolete almost before the first lot were delivered?

New Books

HEATING, VENTILATING, AIR CONDITIONING GUIDE. *1941 Edition. Published by the American Society of Heating and Ventilating Engineers, 51 Madison Avenue, New York. Leatherette Cover. 808 text and 260 catalog data pages. Price, $5.*

To those who have occasion to deal with problems of heating, ventilation and air conditioning in connection with buildings this Guide has long been too well known to need any detailed description of its qualities. This Nineteenth Edition contains a chapter on Transportation Air Conditioning in which the fundamentals of railway passenger car air conditioning are discussed. While the major part of the data in the book pertains to the problems encountered in buildings there are numerous chapters of real interest to the railroad passenger-car designer or to those who deal with the design or installation of air-conditioning apparatus. From the text and tables contained in such chapters as those on thermodynamics, heat transmission coefficients, heating and cooling load, fans, air distribution, duct design and insulation, can be secured most of the basic information that is of interest to railway passenger-car air-conditioning engineers.

GOOD, BAD AND INDIFFERENT

by Walt Wyre

"DID any of the machinists that were notified to report for work answer yet?" Jim Evans, roundhouse foreman for the S. P. &. W., asked.

"Three out of the five we wrote answered," John Harris, the roundhouse clerk, said, "Anderson is working for the government in the arsenal at Rock Island. From what he says he must have a pretty good job because he is going to stay on it. Bailey says he will report within the required thirty-day period and Caldwell will be in to go to work the nineteenth."

"About as I expected," Evans frowned as though he had bitten into a crab apple. "All of the best men that were cut off are working on good jobs. We get what's left and not enough of them. Caldwell never was a mechanic and never will be. Bailey is not much better. I knew that when they were serving their time. The three of them started here in Plainville at about the same time."

"Looks like apprentices must come in bunches of three," John Harris observed. "We are putting on three new ones now."

"Guess that's right, and the railroad will be lucky to get one good mechanic out of the three." Evans had a far away look in his eyes as though remembering the time when other apprentices had started to learn the machinist trade seven years before.

Railroad business wasn't so good then but officials, hoping for better times when mechanics would be needed, had put on a few apprentices. Most shop foremen in the hopes of getting some low-priced labor as a relief for dwindling allowances had encouraged the idea. The young men, pleased with prospects of four years steady employment even at the low rates received by apprentices, were anxious for the jobs. Nobody involved was very seriously concerned about the future until passing time made what had been a very uncertain future then a mighty urgent present with undreamed of demands becoming more urgent as each European country falls like an infested tree with a worm eaten heart.

There were many applications when it became known that the S. P. & W. was going to put on some apprentices at Plainville in 1934. Ed Caldwell was the first one put on. His father was machinist chairman and president of the local shop committee. Young Bailey was hired next. Maybe the fact that the night roundhouse foreman was going with Bailey's good-looking sister didn't have anything to do with the boy getting the job, but it might have, and it's fairly certain that Bailey's father, who worked on the labor gang, didn't have a lot of influence. After the first two machinist apprentices were selected, the master mechanic had considerable difficulty deciding who to recommend for the third and last one. At least a dozen applications were on file. Among them, the least considered was Anderson. Nobody had pushed the application except the boy's dad who was, as now, a quiet, retiring sort of fellow who always falls heir to any jobs that other machinists are afraid to tackle and does them as part of his job and not worth mentioning. The senior Anderson told Jim Evans one day that he thought his boy Dan would make a good machinist if given a chance. Evans agreed, but being busy with other things forgot to mention it to the master mechanic.

A hardware merchant of the town was indirectly responsible for Dan Anderson being selected. One day the master mechanic was walking down Main Street when he was attracted by a display of tools in the hardware store window. In the center of the display there was a model of an S. P. & W. 5000 Class locomotive. It was complete in every detail, even to valve gear and brake rigging. On a card leaning against one of the drivers was lettered, "Built by Dan Anderson."

The merchant happened to come to the door and noticing the master mechanic admiring the display walked over and spoke to him. "Quite a neat job for a boy, don't you think?" the merchant said.

"For a boy," the master mechanic repeated, "Anderson is not a boy; he is a machinist over at the roundhouse."

"But his boy built that locomotive," the merchant said. "They live next door to us," he added.

Next day the master mechanic sent for young Anderson and after talking with the boy a few minutes decided to put him on as the third apprentice.

When the boy started to work he found Caldwell working in the machine shop and Bailey working with the air man. The newest apprentice was placed on the drop-pit. Each of the three boys was very nearly of the same age. They had finished high school together, and had just about equal opportunities, but even a casual inquiry of school records and tendencies would have shown that two of them were square pegs uncomfortably fitted in round holes.

Bailey could make a Latin verb sit up and beg to be conjugated. Some of the themes he had written showed evidence of journalistic aptitude and the school paper won several prizes the year he was editor. Mathematics was a mystery to him and he worried little about it. So far as he was concerned, the area of a circle could be the altitude multiplied by the square root of the hypotenuse, and if it wasn't, what difference did it make?

Caldwell never could make up his mind what he wanted to study in school and was constantly worrying the principal to let him change classes. The teachers had it in for him and when the principal wouldn't allow him to change, then the principal had it in for him too. They let Caldwell graduate because they didn't want to bother with him another year.

Anderson was pretty dumb in English and managed to scrape through Spanish because a foreign language was required. He might have made better grades in these subjects if he had not spent practically all of his spare time in the manual training shop. Mathematics was a hobby and he delighted to confuse the teachers by using methods not found in the text book.

At any rate, regardless of tendencies or vocational aptitudes, the three boys were indentured and it was up to the railroad to make mechanics out of them in four years. Scientists have made silk purses out of the proverbial sow's ears, but it's much easier to make better ones of more suitable material; besides, converting apprentices into full fledged mechanics is a secondary job of railroad supervisors, and they are not scientists either.

A representative of a correspondence school came to Plainville a short time after the apprentices were put on. Evans called the three boys in the office to talk to him about taking a course.

"The railroad company pays part of the cost of the course," the representative explained, "so you can see they want you to have it."

"It's a good thing," Evans agreed, "especially as we do not have any provisions for apprentice schooling here."

Anderson and Caldwell each took out a course. Bailey said he would think about it. After three months Caldwell decided to change the mechanical course he was taking to one in mechanical drawing which he dropped before he had learned the difference between an orthographic projection and an isometric drawing.

IN THE meantime the three apprentices were getting acquainted with grease and grime, smoke and noise and orderly confusion that is part of every roundhouse job. Caldwell started in like he was going to be a real machine hand. In ten days he was doing a fair job running an 18-in. lathe, then just as he was beginning to get on to the work he decided he wanted to do something else and became careless.

The foreman didn't know anything about it until he noticed several newly turned brass bushings in the scrap brass box. "What are those?" Evans asked machinist Cox, who usually made most of the bushings.

"Don't know," Cox replied. "Guess they are some that didn't fit."

"Did you make them?"

"I dont remember who made them," the machinist replied evasively.

Evans questioned other machinists with about the same result. Then he noticed the apprentice Caldwell who was boring a small steel bushing at the time. He was leaning with his right elbow resting on the tail stock of the lathe, indifferent to the chattering tool playing hysterical hop-scotch inside the steel tubing.

The foreman walked over to the lathe and stood and watched until the serrated cut was finished. "Let's look at that tool," Evans said. Caldwell stopped the machine and backed the tool out. "Just as I thought—too dull to cut even if it was set right. Have you learned how to grind a boring tool?"

"I thought I had it ground right," Caldwell replied, "but guess I didn't."

Evans showed the apprentice how to grind the tool and set it to cut without having a chill. Then, admonishing him to be more careful in the future, he went into the roundhouse.

When he came near the drop-pit, he saw Dan Anderson kneeling down on the cement floor and walked over to see what he was doing. The young man seemed to be doing his level best to see how many figures he could make on the cement with a piece of soapstone. He was so absorbed that he never noticed when the foreman came up.

"Doing a little arithmetic?" Evans asked.

Anderson rose quickly, color flooded his face red as a freshly painted caboose. "No—no,sir, that is—yes, sir. I was doing a little figuring."

"What were you figuring?"

Evans' evident interest seemed to relieve Dan's embarrassment. "We just finished running the valves on the 5083," Dan said, "and I was just seeing if I could figure the change Jenkins made."

"Don't you think Jenkins got it right?"

"I guess so," the apprentice replied, "but I can't make it come out like Jenkins did."

"Well, now is as good time as any for you to learn. Where is Jenkins?"

"On the other side of the engine," Anderson said.

"Go tell him to have the hostler line up an engine behind the 5083 and we'll run the valves over just to be certain."

Jenkins was somewhat peeved when it turned out that he had made a mistake in his fractions and that the raw apprentice had caught it.

Evans said to Anderson, "That's the way to do it! Don't take anybody's word for anything unless they prove it! The best of us make mistakes."

Bailey, after working with the air man sixty days, could have written a beautifully worded theme on the subject, but had to be shown each time how to put a gasket on a brake valve. He was a likeable fellow, though, and willing enough to follow instructions to the best of his limited mechanical ability, and no one but the machinist he was working with had any idea but that

the boy was well on his way towards being a first-rate mechanic.

At the end of six months, according to the apprentice schedule, the boys were supposed to be placed on different jobs. Caldwell, after persistent insistence, had already been moved to running repairs in the roundhouse. Bailey, being allergic to lathes and other machinery, wanted to postpone his introduction to them and asked to stay with the air man a little longer and wasn't exaggerating a bit when he told the foreman that there was still a lot he hadn't learned about air.

Anderson wanted to go into the machine shop but, on account of reduced allowance, it had been necessary to cut the drop-pit force to one machinist and the apprentice. Besides costing a lot less, Anderson was by then just about as good as a regular machinist on the drop-pit work. The result was Anderson spent ten months instead of the usual six on the drop-pit.

ONE Saturday when the 5092 was about ready to come off the drop-pit, Evans remarked to machinist Jenkins that if the engine was finished that afternoon he was going to run it on an extra Sunday to take out a short train of work-equipment cars which wouldn't need to run fast.

Young Anderson worked like he was fighting fire in a powder mill until four o'clock that afternoon when the engine was ready to go. The apprentice then went to the office and stood around fifteen minutes trying to get up nerve to talk to the foreman. Finally he raked up the nerve to stick his head through the doorway of the office where Evans was sitting at his desk looking over some work reports.

"Come in, Anderson," Evans said. "What have you got on your mind?"

Dan removed his cap and walked slowly into the office. "Nothing much," Anderson said as he twisted his cap into a wad. "Nothing much—I heard you say you might run the 5092 tomorrow."

"That's right," Evans said. "Is there anything wrong with her?"

"No, sir, at least, I don't think there is. I just wondered if I might ride the engine and see how it runs."

"But you are not working tomorrow," the foreman reminded him.

"No, sir, that's the reason I asked. I thought maybe you wouldn't mind if I rode it Sunday."

"Sure, I'll fix it up! The extra should get out about seven-thirty or eight o'clock. It may be pretty late Sunday night getting back though."

"I won't mind. I've always wanted to ride a locomotive—out on the road, I mean. Thank you." Anderson turned quickly and left the office in such a rush that he stumbled on the threshold.

MONDAY morning Anderson was on the job ready to go to work when the eight o'clock whistle blew, but the redness of his eyes told of a short night in bed. The register showed the 5092 arrived at 3:15 a. m.

"How did you like the ride?" Evans asked him about nine o'clock that morning.

"Just fine," Dan replied with enthusiasm. "I never did know before that a locomotive rattled around so much when it's running. Sure a lot of weight flying around when the main rods start whizzing on a locomotive going sixty miles an hour."

"You look a little sleepy. Better climb up in the cab and rest a bit until Jenkins needs you," Evans said.

"I haven't been helping Jenkins," Anderson said. "He's been out in the machine shop all morning working on something."

"Yes, he's building a winch to drag drivers in from the machine shop to the drop-pit. The electrician has located a spare five-horsepower motor to run the winch. Sure be lots easier than rolling them by hand like we have been doing, and safer, too."

"Five-horsepower?" Anderson repeated as if talking to himself. "That won't pull a pair of main drivers very fast, will it?"

"Oh, I don't know," Evans replied. "Looks like it should. Anyway, we can try it. After you have rested a bit, give Jenkins a hand on it."

The apprentice climbed up in the cab but not to take a nap as Evans had expected. He sat down on the sand box and with his inevitable piece of soapstone began figuring on the lid. The figures substantiated his original opinion that a five-horsepower motor wouldn't have sufficient power to slide a heavy pair of main drivers very rapidly and would require considerable gearing down to move them at all.

Interested in the problem, Anderson soon forgot being sleepy. After he had worked on it some time, he took a piece of waste and erased the figures on the sand box lid, climbed down from the cab and went to the machine shop where Jenkins was working on the winch.

The machinist had gotten a small drum for a cable from some place. Evidently a small hoist, the drum was mounted on a substantial frame. The machinist had several gears and was building a gear box when the apprentice went it.

"How fast is the drum going to turn?" Anderson asked Jenkins.

"Oh, I don't know exactly. The motor runs 1760 revolutions a minute, but I'm going to gear it down a lot."

"Do you think a five-horsepower motor will pull it?" Anderson eyed the gears that were laid out on the bench as he spoke.

"Figure it ought to," Jenkins replied. "The motor on the overhead crane hoist is only 15 horsepower and it will lift over ten tons."

"Lifts pretty slow," the apprentice observed. "Can I help you?"

"Yeah, find the electrician and tell him I'll be ready to try this thing out this afternoon if he can get the motor on it."

Next morning the winch was fastened securely to a post on the side of the drop-pit opposite the machine shop. The cable was hooked to a pair of drivers and the motor started. Swish!—Ooomph! Swish was the sound the cable made as it was rapidly jerked taut by the revolving drum—oomph represents the last sound the motor made before a blown fuse relieved the strain. The pair of drivers just stood there as though nothing had happened.

"Looks like it runs too fast," Jenkins remarked.

"Looks like too much load for the motor," the electrician said.

"Looks like you are both right," Evans observed. "What do you think about it, kid?" The foreman turned to young Anderson who was watching without saying anything.

"Yes," the apprentice agreed, "it needs a larger motor and the speed reduced."

"I can change this five-horse motor for the ten on the cut-off saw in the mill room," the electrician said.

"I don't see how we can reduce the speed any more," Jenkins said. "There is not room for any more gears."

"Wouldn't a small V-belt pulley on the motor and a large one on the gear shaft do it?" the apprentice suggested.

"I believe it would," Evans said. "It's worth trying."

After the larger motor was put on with five-to-one V-belt pulleys, the winch did the job, and it's still going.

A LITTLE over a year after the apprentice started to work, a trade-extension evening class was started in the high school. All three apprentices enrolled as students. The class was in mathematics. The instructor, a machinist that had once taught school, invited all of the supervisors and officials of the mechanical department to visit the class whenever they had an opportunity. Evidently none of them ever had an opportunity, because none of them ever visited the class.

Anderson had not entirely finished the correspondence course he was taking, but the evening class required little more time than the two nights a week he attended. Bailey couldn't keep up with the rest of the class and gave up after two weeks of it. Caldwell decided he could learn more rapidly just studying the book without attending the class. At least that was the reason he gave for quitting the third week.

After two years at Plainville, the apprentices were sent to a back-shop to get experience there. Just before the four years were completed, they came back to Plainville, worked a short time, and received certificates stating that they were full fledged machinists. As each one completed his apprenticeship, he worked one day as a machinist to establish seniority. Bailey was cut off first and was oldest of the three in machinist seniority. Anderson was the youngest.

Bailey had heard that there were jobs to be had in the Texas oil fields and spent several months thumbing his way around. Caldwell got a job working in his Uncle's filling station. Anderson worked extra in a contract machine shop until they found they could use him regularly.

When the government decided that a few more guns might be needed, Anderson was one of the first to apply for a job making them. Caldwell tried it too at several places and didn't like any of them. Bailey didn't like the job he got in a shipyard and he never will like any mechanical job. Added to that is the constant fear of getting fired because he can't do the work. He returned to the railroad because he thought there would be less chance of his losing a job. The only good machinist of the three is unlikely to work for the S. P. & W. again.

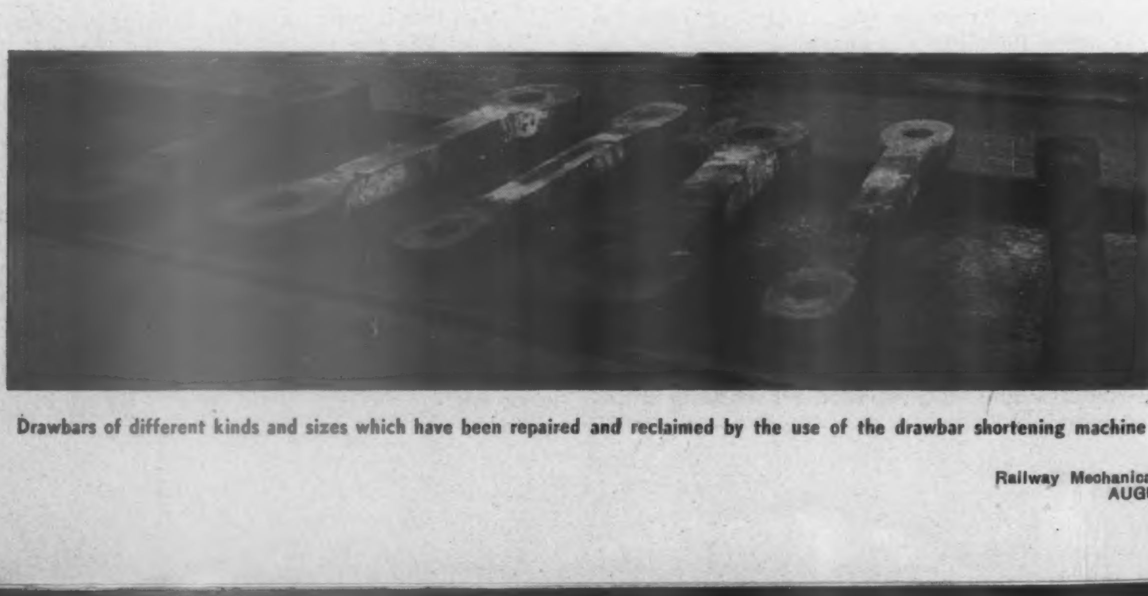
THREE more apprentices are being put on at Plainville. Chances are young Wilson will be one. His dad is road foreman and a good mechanic. Maybe four years on the railroad will overcome the boy's tendency to draw pictures which he does exceptionally well. Young Elliott has been a good hand in a grocery store. Maybe he will be a good mechanic, and there's young Dillon. His dad hopes a job on the railroad will curb his tendency to ramble around over the country. Young Dillon won first prize in the state oratorical contest in his senior year of high school. It might be a good idea for him to stay in practice. He may need it to talk some one into giving him a job four years from now.

Drawbar-Shortening Machine

THE drawbar-shortening machine, shown in one of the illustrations, is now being used at the Atchison, Topeka & Santa Fe shops, San Bernardino, Cal. The machine will take drawbars varying in length from 58 in. to 97 in., and the character, as well as wide range of work handled, is indicated by the second view showing six short drawbars resting on a concrete storage platform just outside the blacksmith shop building.

In view of the relatively heavy forging operation which must be performed and the severe stresses introduced by hammer blows, the drawbar-shortening machine is made exceptionally rugged in construction and mounted on a substantial foundation which consists of four locomotive guides set vertically in large cement blocks in the shop floor. The frame of the machine is made of two 30-in. steel I-beams, 22 ft. long, spaced 26 in. apart and anchored to the supporting guides in the floor by means of four angle brackets with 2-in bolted coil-spring connection to the guides as shown at *A*. This construction cushions the shock at each hammer blow by allowing the machine to move backward slightly at the moment of impact. Experience has shown that it is almost impossible to maintain this type of forging machine permanently fixed to a rigid foundation without some such method of cushioning the hammer blow.

Referring to the illustration which shows the drawbar-shortening machine, the general construction will be readily apparent. On the nearer, or right-hand end, a slotted header forging is riveted to the top of the I-beams with a sufficient number of closely spaced ⅞-in. rivets



Drawbars of different kinds and sizes which have been repaired and reclaimed by the use of the drawbar shortening machine

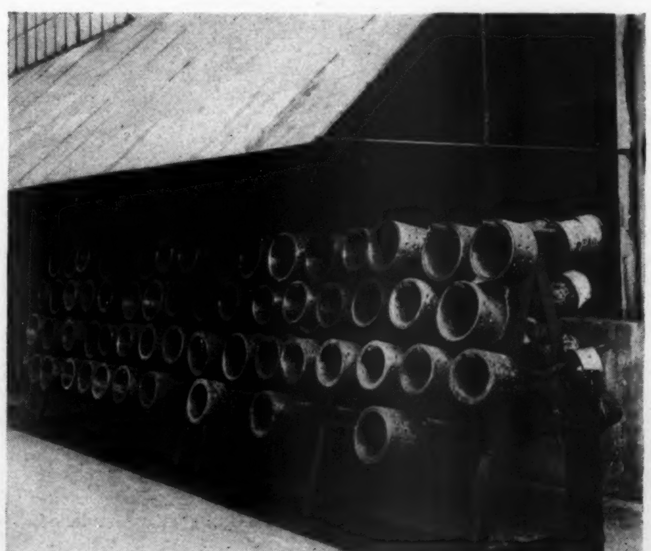
Drawbar shortening machine which is used at the Santa Fe shops, San Bernardino, Calif.

to make the forging an integral part of the machine. This substantial forging forms a solid stop for the cold end of the drawbar, which is supported on suitable cross-bars. Near the center of the machine is a sliding header die which either forms or upsets the heated end of the drawbar when struck by a heavy pneumatic hammer operating in a horizontal direction. This die block, which measures 20 in. wide by 15½ in. long by 6 in. thick, slides on two ⅜-in. by 3-in. steel liners, suitably lubricated from oil cups. The hammer which strikes this die block is connected to the outer end of a piston rod and piston moving in the 6-in. by 6-ft. long air cylinder *C*, shown at the left end of the machine. This piston with the attached hammer is operated by air under the control of a conveniently located three-way valve to deliver two or three heavy blows in quick succession, or more if necessary in upsetting large drawbars. The pneumatic hammer strikes the die and not the drawbar. Filler blanks give adjustment for both varying drawbar lengths and side widths.

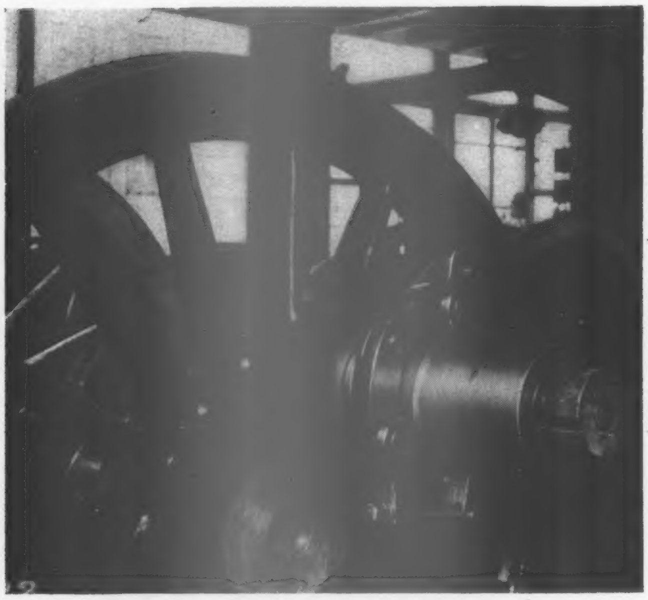
This machine is used primarily for reforming drawbar heads in the case of elongated holes, and when not enough stock remains to do this a patch is sometimes welded on the end of the drawbar and the head completely reformed and brought back to standard. In welding, the first few seconds after the drawbar is removed from the fire are of the utmost importance and the arrangement shown in the illustration facilitates the necessary quick handling. The drawbar is trammed cold and the machine set with filler blocks of the correct length and width so that everything is in readiness for the weld. When a welding temperature has been reached, the drawbar is quickly transferred to the machine by means of the long handle extension bolted to the cold end the usual chain suspension from a jib crane. The necessary preliminary hammer blows may then be struck while the steel is still at a welding temperature. The drawbar is usually put back in the fire and reheated for a second working in the machine and some work is necessary under a steam hammer for straightening the head, removing burr and driving a steel pin through to size the hole. This drawbar-shortening machine is accurate to within about ⅛ in. and may be used in welding and reforming both heads for a large drawbar in approximately 5 hr. time, or 3 hr. less than would be required by the use of a steam hammer alone.

Rod Bushing Rack

A neat and convenient rack for storing second-hand rod bushings where they can be readily examined and calipered for size, is shown in the illustration. It is at the



Locomotive rod-bushing rack which provides neat storage and ready accessibility for calipering



Husky three-bearing roller used in rolling all crank pins after being turned at San Bernardino shops of the Santa Fe

San Bernardino, Cal., shops of the Atchison, Topeka & Santa Fe. This rack is approximately 18 ft. long, and is made in two sections, each 9 ft. long by 5 ft. high by 3 ft. wide at the base. The rack is made of welded 3-in. angle sections with 1-in. transverse pipe sections set in at regular intervals to support the bushings. The total capacity, including both sides of the rack, is 128 large bushings, although this capacity may be increased in the case of small bushings which are sometimes doubled up on the pipe holders, as shown at the back in the illustration.

In Santa Fe practice no second-hand bushings are used other than those which will bore and turn to accurate size for the position in which they are applied. Crank pins, however, are turned to ¼ in. under size and steel bushings ground to ¼ in. oversize. Consequently, bushings applied just before the wear limits are reached have some extra thickness which may be machined off in fitting the bushings to new crank pins and new steel bushings.

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Relieving Boiler Stresses Caused By Welding

Q.—Should welding on locomotive boilers be stress relieved.—J. M. F.

A.—It is not the general practice to stress relieve welding on locomotive boilers due to the fact that welding on locomotive boilers is practically limited to that part of the boiler where the strength of the boiler is not dependent upon the strength of the weld. When welding on locomotive boilers, care should be taken to keep to a minimum the stresses set up in the sheets due to the welding process. There are several ways of doing this.

Peening is an effective method of reducing stresses and of partly correcting distortion or warping. Step-back welding will reduce locked-up stresses and warping due to the more uniform distribution of heat and the greater rigidity of the seam during the welding process.

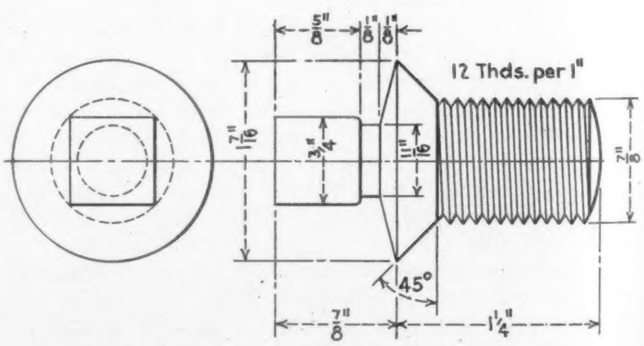
The A. S. M. E. code requires that all pressure vessels built in conformance to the code shall be stress relieved. This would apply to all locomotive boilers built or operated under that Code.

Use of Patch Bolts in Making Boiler Repairs

Q.—Is it permissible to use patch bolts in applying patches to locomotive boilers in locations where it would be necessary for the enginehouse to remove tubes and flues in order to apply a riveted patch. The boiler has a working pressure of 210 lb. What type of patch bolt should be used?—J. E. R.

A.—It is permissible to use patch bolts for applying patches to locomotive boilers, but it is not desirable and should be avoided whenever possible. An application of a boiler patch with patch bolts should only be considered as a temporary repair to be replaced with a riveted patch at the first opportunity. The application of patches should be made with rivets to obtain the best results.

The objection to applying a boiler patch with patch bolts is that only an external examination of the crack can be made. When an internal examination is made, it is often found that the crack is considerably larger inside than apparent from the outside. For this reason, a patch applied with patch bolts should only be considered as a temporary repair and should be renewed with a riveted patch at the first opportunity so that a complete examination of the crack can be made.



Typical patch bolt for applying boiler patch

Another objection to the use of patch bolts is that it becomes necessary to ream out the holes and apply oversize rivets when they are removed, thus affecting the efficiency of the patch. A typical patch bolt is shown in the illustration.

Wood Fuel for Locomotives.—Swedish State Railways will equip steam locomotives for burning wood fuel in view of the necessity of reducing coal consumption in the country during the unsettled conditions in Europe.

The Milwaukee Road

Reclaims Car Axles

By J. W. Crossett* and G. Ireland†

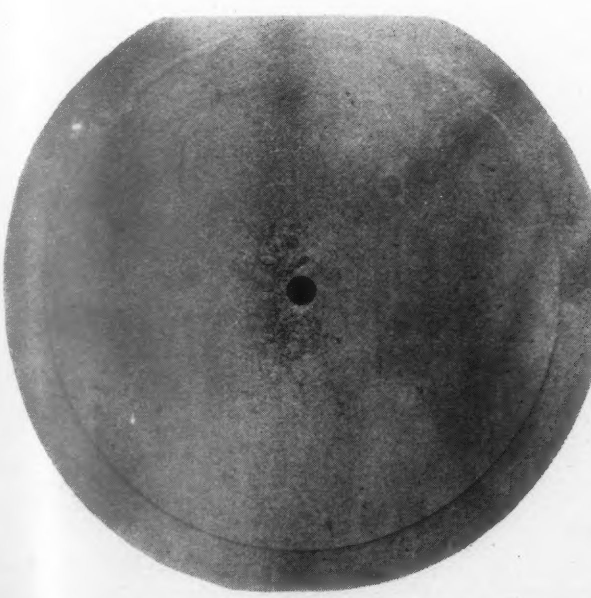
Out of 246 axles inspected in two years, 154, or 62.6 per cent have been reforged and heat-treated for use as roller-bearing axles

The Chicago, Milwaukee, St. Paul & Pacific, like many other Class I railroads, found themselves possessing a preponderance of friction-bearing car axles, which had to be stored, inventoried and re-inventoried, and a perpetual shortage of roller-bearing axles which were continually being purchased. In order to remedy this condition a reclamation program was initiated wherein the older freight and passenger friction type axles of the 5½-in. by 10-in. size were reforged to make roller-bearing axles.

* Assistant metallurgist, C. M. St. P. & P.
† Forge shop supervisor, C. M. St. P. & P.

Experience in investigating failures of axles of this older type warned against promiscuous selection for reforging as the journals are liable to be heat checked and some of the axles were forged from low quality steel. The heat checks do not present a major problem as they either open up during forging or are found when the completely machined axle is examined by the Magnaflux method. This lack of quality in the steel, found by etching in hot dilute hydrochloric acid, as shown in Fig. 1, is due either to poor forging technique or mill practice. Axles of this quality are satisfactory for freight or slower passenger service where the factor of safety is exceedingly high but would not prove satisfactory under the modern high-speed streamliners where excess weight is held to a minimum and the factor of safety is more rational.

To make certain that none of these inferior quality axles were used for reclamation, a method of testing was developed in which one end was sawed off each axle, both parts identified with a serial number, and the small slab turned over to the Milwaukee test department. At



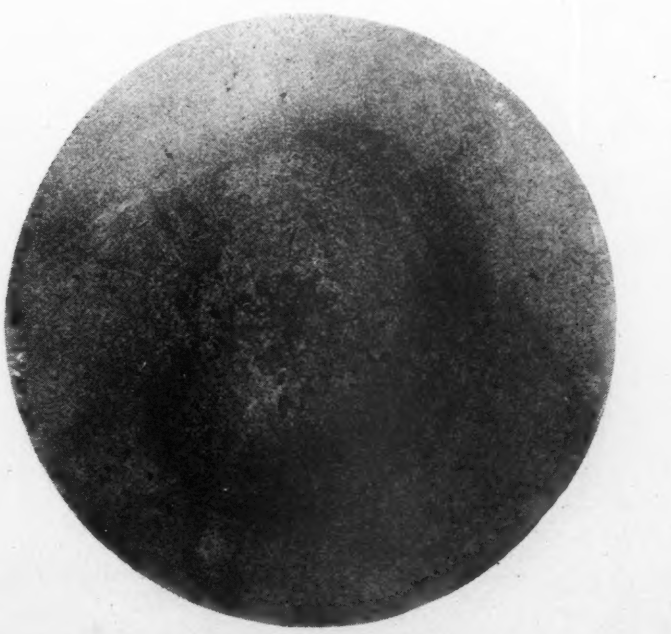


Fig. 1—Etched sections show unsatisfactory quality in some of the car axles found unsuitable for reforging

the beginning of this program two years ago, it was felt that a complete chemical analysis, microscopic examination and a deep etching were necessary but after completely analyzing 25 ends is was found that the manganese, phosphorus and sulphur contents were satisfactory, and to save time only a carbon determination was run on the next 70 axles. Inasmuch as the carbon content of these 70 axles fell within the range fo the A. A. R. Specification M-101-39, or .40 to .55, it was felt that this was also unnecessary. A microscopic examination was also made on the first 25 axles, but as the majority were uniformly coarse grained, 90 per cent being classified as McQuaid-Ehn No. 1, and showed a Widmanstatten structure indicating unsatisfactory heat treatment, or none at all, this was also discontinued. Some typical micro-photographs are shown in Fig. 2.

After the test department completed their work, the axles were marked as being either satisfactory for reclamation or scrapped. When enough good axles were on hand to provide a full day's work for a hammer crew they were reforged. This reforging was done by two methods in our shops. The first, the more obvious one, consisted of taking an axle as shown in Fig. 3, previously sawed off at AA for test purposes, and drawing out the two tapered sections BB. This method had two disadvantages; the axles had to be drawn out one end at a time, necessitating two heats on each axle. It is difficult to reforge an axle in this manner and keep it straight. To overcome these disadvantages, a jig, shown

Table I—Typical Chemical Composition of Untreated Car Axle

	Per cent
Carbon	0.48
Manganese	0.61
Phosphorus	0.010
Sulphur	0.034

Table II—Physical Properties of Car-Axle Test Specimens, Untreated and Heat Treated

	As received	Quenched and tempered
Yield point, lbs. per sq. in.	40,200	63,600
Tensile strength, lb. per sq. in.	77,500	98,400
Elongation in 2 in., per cent	25.0	21.0
Reduction in area, per cent	35.3	47.5

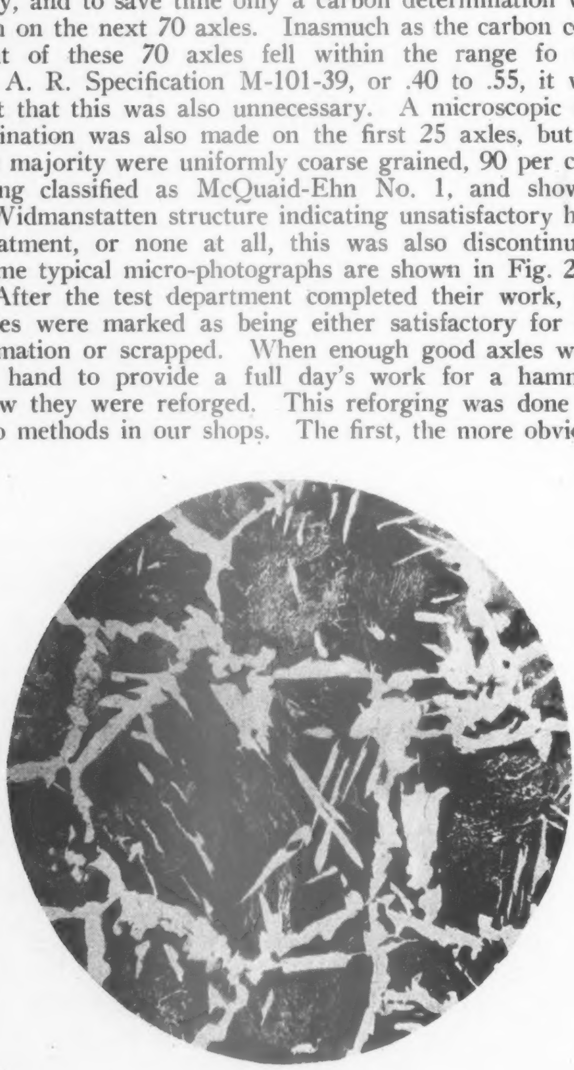
Table III—Normal Chemical Composition of a Car Axle Reforged by Improved Method

	Per cent
Carbon	0.52
Manganese	0.38
Phosphorus	0.050
Sulphur	0.047

Table IV—Physical Properties of Test Specimens Taken from a Reforged Axle

	End	Center
Yield point, lb. per sq. in.	55,200	51,200
Tensile strength, lb. per sq. in.	88,900	93,600
Elongation in 2 in., per cent	30.0	26.0
Reduction in area, per cent	51.4	45.0

in Fig. 4, was fabricated by welding from unmachined sections cut on the oxygraph machine. To reforge an axle in this jig, the axle is cut off just behind the coller at C and this end heated for forging. When a forging heat is reached the sawed end is placed in the hollow of the die A and held in place by supports B and C. The mating wedge D to the wedge welded on the back of the die A is put in place and the hammer forces it down, which, in turn, shortens and thickens the journal section.



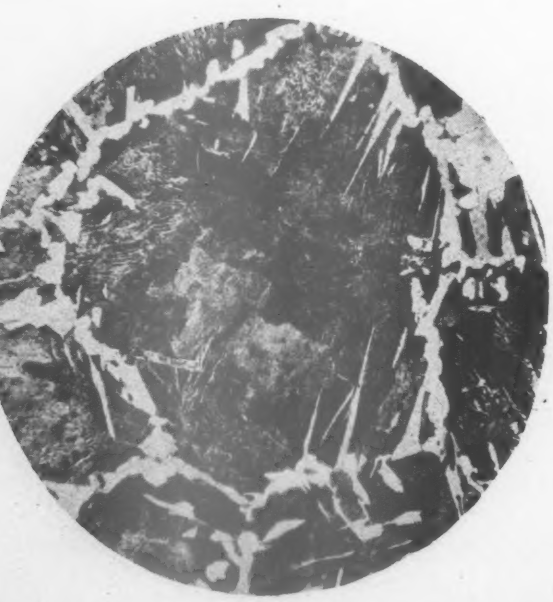


Fig. 2—Typical microphotographs showing coarse grain structure of car axles before being heat treated

By this method the daily output is increased and a straighter axle is obtained.

It is obvious that the low initial physical properties of the steel are not improved by heating for this reforging process. In order to determine what improvement could be expected by heat treating these axles, one of the ends that had been sawed off at point *A* for test purposes was

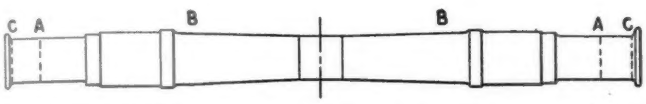


Fig. 3—General design and proportions of the scrap car axle before being reclaimed

split in half parallel to the length of the axle. These two halves had the typical chemical composition, shown in Table I. One of these sections was left as received and the other oil quenched and tempered. A standard .505-in. tensile bar was taken from each section and the physical properties obtained from these bars are shown in Table II. The yield point, which is the value most design calculations are based on, was improved 50 per cent and the tensile strength raised over 27 per cent. The elongation was reduced slightly but this loss was

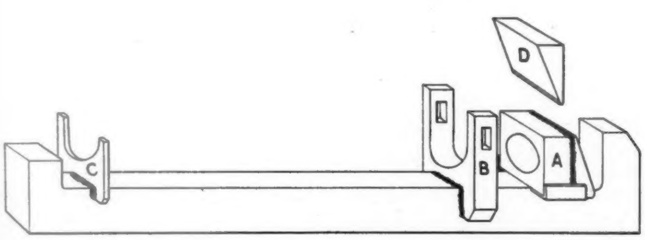


Fig. 4—Special jig used in upsetting heated car axle end under a steam hammer

compensated for by the gain in reduction in area. These changes are readily understandable from the microstructure of the two pieces shown in Fig. 5. The coarse-grained Widmanstatten structure, typical of the as-received axles, was converted to a fine-grained sorbitic structure insuring a maximum degree of toughness and fatigue resistance.

These axles at present are being oil quenched from 1,525 deg. F. and drawn for three hours at 1,100 deg. F. After heat treatment they were sawed to length and turned over to the machine shop for final processing. A remarkable improvement in machinability was found to have been brought about by the heat treatment, which increased the hardness from about 120 to 185 Brinell hardness and changed the structure from pearlite to sorbite.

One of the axles which had been reforged by the newer method was taken for metallurgical investigation to determine what was actually being obtained. A microscopic examination of a section cut through the upset journal showed the flow lines formed by this method to be satisfactory, there being no abrupt changes, folds or cross flows.

Two tensile bars were obtained from the axle which had the normal chemical composition of Table III, both being parallel to the length, one taken midway between the center and the surface of the upset end and the other at the intersection of the longitudinal and transverse center lines. These results shown in Table IV are not as good as those obtained by treating the small end section but are still much better than found in the original axles. The microstructure of the heat-treated axles indicate a lack of complete refinement which condition could probably be overcome by normalizing before quenching.

Since the initial program was begun two years ago, 246 axles have been inspected and 154 or 62.6 per cent have been found to be suitable for reclamation. This percentage could have been increased, but safety was the prime consideration and there was tendency to lean backward and scrap axles with the slightest amount of unsoundness. The axles marked as being unfit for reclamation were initially scrapped, but with the present steel shortage they are hammered down to make parts such as coupler bolts and wrist-pin washers where the stresses are not high. When this reclamation program was begun the chief desire was to cut down the inventories and use up some of the older axles but under the present defense program with the steel shortage and priority number it becomes almost imperative to continue reclaiming the older axles to meet the normal replacement demands.

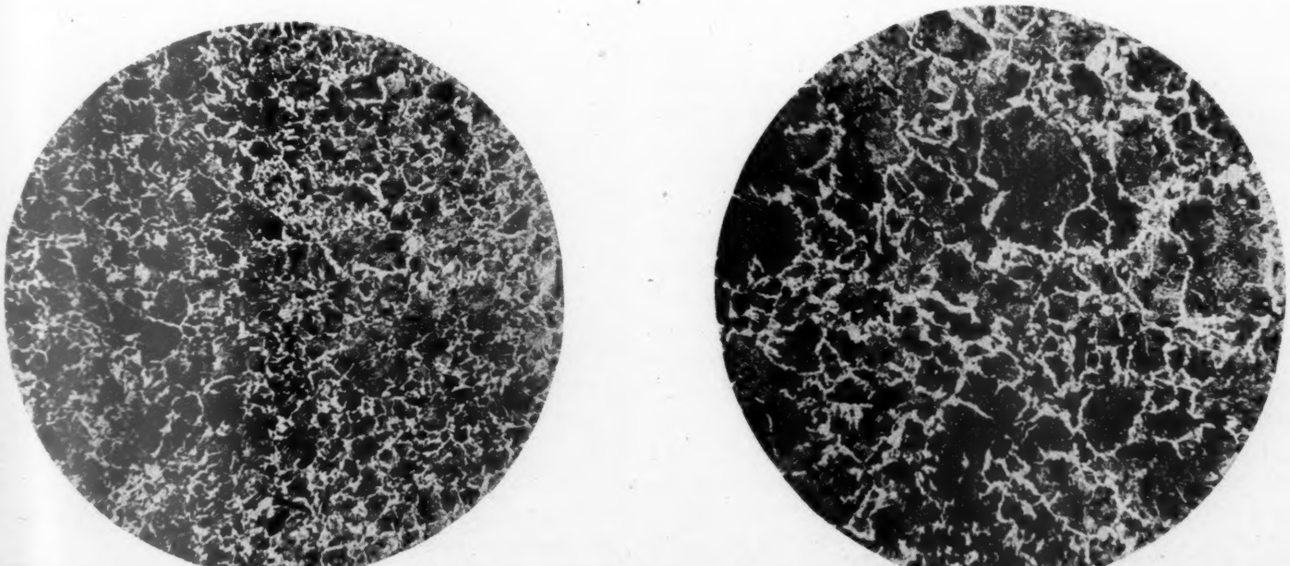


Fig. 5—Microphotographs of reforged car axles which have been tempered and quenched. (Left) Center test bar. (Right) End test bar

Air Brake Questions and Answers

AB-8, Empty and Load Equipment*

1—*Q.—For what is the AB-8 Empty and Load Brake supplied?* A.—For light weight cars having a high load capacity.

2—*Q.—Does the AB brake not answer the requirements in this respect?* A.—The AB brake is a single-capacity brake, developing a constant braking force whether the car is empty or loaded. This brake develops a braking force equivalent to 60 per cent of the empty car weight, based on 50 lb. pressure in one 10-inch brake cylinder and is used on cars having an empty weight of 58,000 lb. or less, and a carrying capacity of less than three times the empty car weight.

3—*Q.—How does an increasing load affect retarding force?* A.—As the load increases, the retarding force is less effective with the single-capacity brake.

4—*Q.—Why will a constant braking force fail to produce effective braking in all cases?* A.—On light-weight cars having a high load capacity the spread between light and loaded weight is so wide that a constant braking force will not produce effective braking under both extremes. A high constant value for effective load braking is excessive for empty braking and a low value for empty braking is inadequate for load braking. There is either too much empty brake force or too little load brake force.

5—*Q.—On what type car is the AB-8 Empty and Load brake generally applied?* A.—Gondola or hopper cars used principally in coal or ore service, where they generally operate either empty or fully loaded.

6—*Q.—What braking ratio does the AB-8 Empty and Load Brake provide?* A.—Sixty per cent of the car's weight when empty and generally about 30 per cent of the maximum loaded weight (which can be made to suit local conditions) based on a brake cylinder pressure of 50 lb. per sq. in.

7—*Q.—How does this brake differ from the standard AB brake?* A.—Functionally, there is no difference, the basic AB equipment being used with the addition of supplementary apparatus embodying the function of a double-capacity brake. Thus the basic AB brake is retained so that the interchange characteristics are unaffected.

8—*Q.—What does the supplementary apparatus represent?* A.—A minimum addition to accomplish the purpose of the load brake consisting only of a load cylinder and change-over apparatus.

9—*Q.—What does the change-over apparatus consist of?* A.—A change-over valve and a strut cylinder.

10—*Q.—How is the change-over function accomplished?* A.—It is fully automatic, changing when the load is changed, and the brake-pipe pressure is restored after being depleted.

11—*Q.—What additional air consumption is involved with this brake?* A.—None. Standard AB reservoirs are used for volume.

12—*Q.—Are additional lever members required?* A.—On some installations the location and arrangement of the brake cylinders is such that no additional levers are required. On other installations, due to space limitations, one additional lever is required.

13—*Q.—What are the parts of a complete set of AB-Empty and Load equipment.* A.—One ABEL-1 valve, Fig. 3; one AB-1 change-over valve, Fig. 7; one 8-in. by 8-in. or 10-in. by 10-in. load brake cylinder, Figs. 1 and 15; one 8-in. by 12-in. empty brake cylinder, Figs. 2 and 14; one strut cylinder and bracket, Fig. 9; one truck bolster bracket, Fig. 12; one car bolster bracket, Fig. 13; two ½-in. hose with reinforced fittings; one combined auxiliary and emergency reservoir; two 1¼-in. angle cocks; two 1⅜-in. hose with couplings; one pressure retaining valve; one combined dirt collector and cut-out cock and one branch-pipe tee.

* This is a new series of questions and answers which supplements and brings up to date the original series on the AB equipment which appeared in *Railway Mechanical Engineer* from April 1936 to March, 1939. As in previous series references to figure and part numbers are to the manufacturers' instruction pamphlets.

Decisions of Arbitration Cases

(The Arbitration Committee of the A. A. R. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

Car Damaged Due to Impact Switching—Handling Line Responsible

On October 11, 1939, at Dayton, Ohio, a Baltimore & Ohio locomotive moved a cut of 40 cars into a track on which 55 cars were standing. In making the coupling, Mississippi Central steel-center flat car No. 2114, the second car in the standing cut, failed, resulting in damage to the center, intermediate and side sills. Disposition was requested under A. A. R. Rule 120, owner's responsibility. The Mississippi Central would not agree to recognize the settlement of this case as coming under A. A. R. Rule 120 as in its opinion and interpretation of Rule 32 it was a handling line responsibility and it insisted on settlement being made under Rule 12. The B. & O. stated that there was no other damage to any car and furthermore the 55 cars standing on the track had been inspected prior to the coupling of the 40 cars and no exceptions had been taken. The B. & O. thought that the handling of this car should not come under impact switching as it is an operation that takes place very frequently where trains are doubled from one track to another to get sufficient tonnage before leaving a terminal. It claimed that had this damage occurred when a car or a cut of cars had been switched in, or shoved over a hump, and improperly controlled, the damage would have been given proper consideration. As there was no derailment or other Rule 32 condition involved, the B. & O. believed the damage to be car owner's responsibility. The Mississippi Central understood that Paragraph (d), Section (10) of A. A. R. Rule 32 establishes a specific dividing line as to the responsibility for damages resulting from impact switching. It stated that the B. & O. acknowledged that this car was damaged to the extent shown in Rule 44 and as there were six sills broken and two center sills bent, the Mississippi Central considered that the accident was caused by coupling a moving cut of cars to a standing cut at a speed exceeding the limits of safety. It contended, in view of the facts, that the B. & O. should be held responsible for the full amount of the damage.

In a decision rendered November 14, 1940, the Arbitration Committee stated: "This car having been damaged in switching to the extent specified in Rule 44, the handling line is responsible under the provisions of Rule 32, Section (10), Paragraph (d)."—*Case No. 1779, Baltimore & Ohio versus Mississippi Central.*

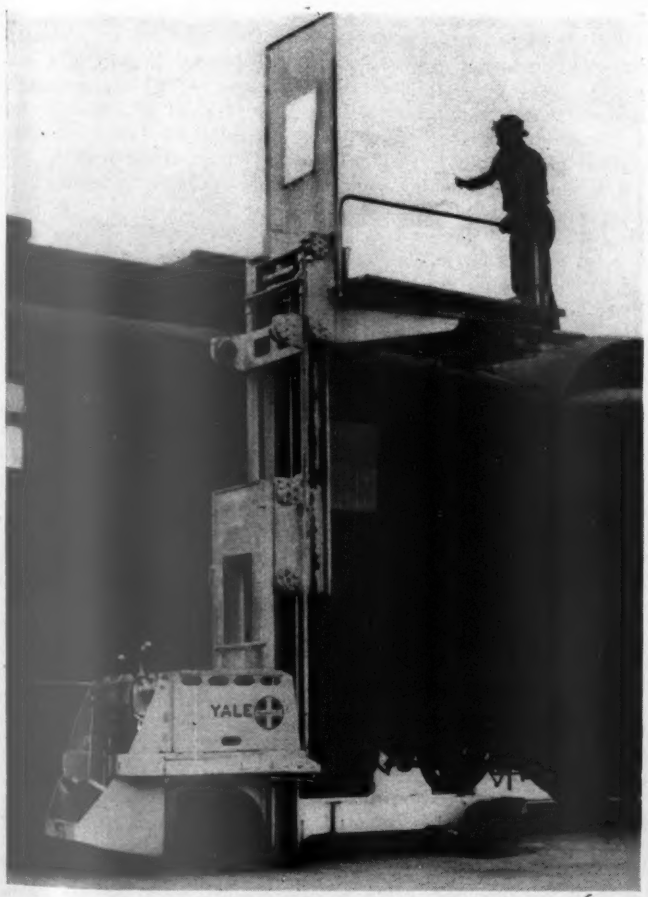
High-Lift Truck for Icing Passenger Cars

Railway passenger cars, particularly dining cars on long runs, require the replenishment of their supply of ice at intermediate station stops. The ice is carried in bunkers located in the roofs of the cars and each car usually has from two to four bunkers varying in capacity from 300 to 900 lb. per bunker. Also, a supply of ice is carried in the dining-car kitchen at floor level.

The usual practice in icing such cars is to haul the ice in full cakes of 300 lb. each on a baggage truck alongside the car, one man on the truck breaking the ice into about 10-lb. pieces and tossing them to a man on the car roofs who drops them into the bunkers. This method is slow and there is also a risk of ice chunks falling upon near-by passengers, or possibly breaking car windows.

To reduce the time of icing cars and also lessen the possibility of personal injuries, electric lift trucks of special construction have been introduced, the one illustrated being used at the Albuquerque, N. M., passenger station of the Atchison, Topeka & Santa Fe. It consists of a Yale & Towne 4,000-lb. telescopic electric storage-battery truck with remote control from the loading platform

Electric storage-battery-operated truck with icing platform at intermediate level



Yale & Towne high-lift electric truck used in icing Santa Fe passenger cars at Albuquerque, N. M.

for raising and lowering. This platform is 38 in. wide by 66 in. long by 16 in. high in the low position. It has a maximum height in the fully-raised position of 42 in. The truck platform is equipped with a folding catwalk and removable safety handrail on each side. The overall dimensions of the truck are 148 in. long by 56 in. wide by 95 in. high in the collapsed position. It has 20-in. by 5-in. drive wheels and 15-in. by 7-in. trailer wheels, spaced 80 in. on centers. When loaded with ice, the platform will support nine cakes, or about 2,700 lb.

This truck is employed in the icing of four Santa Fe daily trains and five semi-weekly trains, also certain refrigerator express cars. Each train has from one to three cars requiring icing. The average amount of ice supplied to each train is about one ton, and the number of times the platform is lifted and run down and lifted again varies from three to five for each car iced. The platform is raised to its high position in 44 sec., and lowered in 22 sec. The platform is lowered each time the truck is moved to another location.

The use of this truck has resulted in the saving of eight man-hours on each of the two shifts where the truck is used. It has also reduced the time and cost of moving ice from the ice house, which formerly took about an hour, with two or three men to push the baggage truck. By means of the electric truck, one man can make the run in about 15 min. The use of this truck for icing express cars has saved taking these cars from the train to the ice house. Specific figures on the amount of this saving are not available.

Ice for Pullman and coach car fountains is obtained by porters from small ice carts, about 3 ft. by 5 ft. in size, drawn along the platform by hand and not served by the icing truck.

By use of this high-lift, electric icing truck the force icing cars has been reduced and more time is available for the remaining men to clean or otherwise service the lay-over equipment in the yards.

High Spots in
Railway Affairs . . .

Railways Handle Grain Crop Successfully

The Car Service Division of the A. A. R. took even more than the usual precautions to make sure that the railroads would handle the wheat crop promptly. The problem was complicated by the fact that they first had to move about 40,000,000 bushels of the stored 1940 crop. They not only did this, but handled promptly all of the 1941 wheat for which storage space could be found. The problem developed into one not of transportation, but almost entirely of storage. The Commodities Credit Corporation has had a difficult time attempting to correct the storage situation, and apparently fell down badly on its assignment.

Transportation Of Armed Forces

National defense activities have made a heavy demand upon railroad passenger facilities in recent months. This additional load, however, has not interefered with the regular freight and passenger services. The total number of the nation's armed forces moved by the railroads in the first half of 1941 was 1,452,303. This included the armed forces of the Army, Navy, Marines and selectees, as well as members of the Civilian Conservation Corps. Of this number 859,230 were handled on 2,861 special trains. The remainder, including 503,425 selectees, were handled on regular trains, the selectees for the most part being moved from induction stations to reception centers.

Panama Canal Traffic Goes to Railroads

Because of the extensive transfer of American ships to British service, intercoastal traffic through the Panama Canal has been considerably diminished and much transcontinental business has been transferred to the railroads. The effect of the transfer and sale of ships first became noticeable in the summer of 1940. The Southern Pacific traffic, measured in ton-miles during 1940, was the largest in the company's history. In 1940 it handled more than 17,528,000,000 ton-miles of freight, as compared with its former high record of less than 16,500,000,000 in 1929 and 15,393,000,000 in 1939. Contrasted with this, all of the Class I railroads in 1940 handled only 81 per cent as much traffic as in 1939, and 75 per cent as much as in 1929. The Southern Pacific, Santa Fe, Northern Pacific and Union Pacific all showed a greatly increased average haul in 1940, as compared to previous years. Not only has the intercoastal traffic been diverted to the railroads, but they have also been called upon to handle other steamship tonnage at Pacific ports, formerly moved East by way of the Panama Canal.

I. C. C. Headquarters

The Interstate Commerce Commission has a splendid office building in Washington that is coveted by some of the other numerous bureaus that have been growing by leaps and bounds under defense activities. The suggestion has been made in Congress that in the proposed government decentralization it might be well to transfer the Interstate Commerce Commission to Chicago. This has stirred up considerable consternation among the large number of practitioners and others who have established residences in Washington. Southern interests, also, are very much averse to such a move. Interestingly, the I. C. C. Act specifically states that it should have its headquarters in Washington, and before its base can be shifted it will be necessary to enact new legislation. The opposition to the move is so great that it is extremely doubtful if such a change in the Act can secure the necessary votes.

The Steel Supply

Walter S. Tower, president of the American Iron & Steel Institute, in speaking before the purchases and stores officers at Chicago, emphasized the fact that there is ample steel production in this country to take care of our domestic civilian requirements. He cited the following to support his contention: "Available facts justify the belief that both this year and in 1942 there will be fully 67,000,000 tons of steel-making capacity which can be used for domestic civilian consumption and for whatever exports may seem desirable to countries other than Britain and Canada. Such other exports are not likely to call for more than 3,000,000 tons of ingots, leaving a minimum of 64,000,000 tons for domestic civilian uses. This country has never in any year been able to use any such quantity of steel. Even in 1940, total domestic consumption, including defense and civilian uses, was only 55,000,000 tons." He also directed attention to the fact that the Office of Price Administration and Civilian Supply has issued an order giving preference to materials for car building and repair over all other civilian uses.

Little Danger From Handling Explosives

The Bureau of Explosives, A. A. R., is greatly to be commended for its achievements over the years. Through a careful and persistent campaign of education and its staff of field work inspectors, steady progress has been made in reducing the number of accidents. Last year, 1940, a total of 818 accidents occurred, involving a property loss of $142,829, chargeable to accidents involving explosives and other dangerous articles. There were but three accidents in the transportation of explosives in Canada and the United States during the year; these included two slight explosions in the handling of toy torpedoes and one explosion in a freight house from blasting caps and dynamite awaiting removal by the consignee. Including all other dangerous articles under the jurisdiction of the Bureau, there were 68 fires, two deaths and 74 persons injured.

Transporting Oil To the East Coast

Harold L. Ickes, petroleum co-ordinator for national defense, gave the East a bad scare when he announced some time ago that the transfer of tankers to British shuttle service, coupled with the increasing consumption, might make it necessary to restrict the use of gasoline for motor cars and fuel oil for domestic heating during the coming months. As pointed out by J. J. Pelley, president of the Association of American Railroads, the railroads for many years have been a diminishing factor in the transportation of oil, since the oil companies have built up their own transportation systems of tank ships, barges, pipe lines and tank trucks. It appears that there are unused tank cars owned by private line companies that can be used for this purpose, although the transportation cost may be somewhat increased. Secretary Ickes in a statement late in June called upon the oil companies to give attention to the possibilities of the greater use of such tank cars.

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NEWS

Compliance Section, OPM

A COMPLIANCE Section, headed by L. J. Martin, has recently been created to "control and supervise compliance cases arising through complaints from within OPM, from within the armed services, and from industry and the public."

A. C. L. Shop Forces On 48-Hr. Week

SHOP forces of the Atlantic Coast Line were placed on a 48-hr. per week work basis effective the week of June 22. Prior to June 1, shopmen had been working, with minor exceptions, 40 hr. a week. On that date the work-week was lengthened to 44 hr., which, to further facilitate the road's program of repairing and returning to service all freight cars when age and condition justifies, has been prolonged to 48 hr., thereby increasing output 20 per cent.

Railroad Repairs Given Priority Status

PRIORITY status for repair and maintenance materials for 26 industries including the railroads was assured during the week ended July 5 when the Civilian Supply Allocation Division of the Office of Price Administration and Civilian Supply promulgated an allocation program covering such items.

Action was necessitated, said the O. P. A. C. S. announcement, by growing demands on raw materials as result of the defense program and the priorities granted in connection therewith which have made it difficult for manufacturers of repair and maintenance materials and equipment to fill their orders. The effect will be to assure continued operation of essential industries and services which otherwise might have to curtail because of inability to secure needed repair or maintenance parts, the announcement concluded.

Plate Capacity for Car Materials To Be Increased

CAPACITY of wide strip steel mills to make light plates for railroad cars, ships and other purposes will be increased 754,000 tons to a total of 2,480,000 tons by the early part of 1942, according to the Office of Production Management. W. A. Hauck, OPM steel consultant, disclosed that outlook after visiting several strip mills and compiling results of a questionnaire submitted recently to the 13 mills rolling strip 54 in. or more wide.

Present total capacity of these mills is 12,941,400 tons, of which 1,726,000 is light plate capacity and 11,21,400 is for the manufacture of strip. Of the additional plate capacity to be provided, 654,000 tons will be obtained gradually by the end of this year and 100,000 will be available by March 1, 1942. The OPM announcement said that a regulation will be issued shortly to all steel companies with strip and plate capacity, requesting them to reallocate to strip mills plates now scheduled for the regular plate mills, in cases where the sizes and quantities are better suited for strip mill production. Meanwhile, additional heavier plate capacity is being installed by some of the companies that have strip mills, and more plate capacity is being provided also by companies not operating strip mills. Further additional capacity is proposed in the overall expansion of the steel industry now under consideration.

Orders and Inquiries for New Equipment Placed Since the Closing of the July Issue

LOCOMOTIVE ORDERS

Road	No. of Locos.	Type of Loco.	Builder
Boston & Maine	2	44-ton Diesel-elec.	General Elec. Co.
Clinchfield	8	4-6-6-4	American Loco. Co.
Delaware & Hudson	15[1]	4-6-6-4	American Loco. Co.
Elgin, Joliet & Eastern	2	1,000-hp. Diesel-elec.	Baldwin Loco. Wks.
Florida East Coast	3[2]	2,000-hp. Diesel-elec.	Electro-Motive Corp.
Illinois Central	2[2]	4,000-hp. Diesel-elec.	Electro-Motive Corp.
Lehigh Valley	3	44-ton Diesel-elec.	General Elec. Co.
New York, Ontario & Western	5	44-ton Diesel-elec.	General Elec. Co.
New York, Susquehanna & Western	6	1,000-hp. Diesel-elec.	American Loco. Co.
Ohio & Morenci	1	35-ton Diesel-elec.	Davenport-Besler Corp.
St. Louis-San Francisco	15[3]	4-8-4	Baldwin Loco. Wks.
Seaboard Air Line	3	5,400-hp. Diesel-elec. frt.	
	2	2,000-hp. Diesel-elec. pass.	Electro-Motive Corp.
	2	1,000-hp. switchers	
	3	1,000-hp. switchers	Baldwin Loco. Wks.
	3	1,000-hp. switchers	American Loco. Co.
Southern	1	1,000-hp. Diesel-elec.	Baldwin Loco. Wks.
	1	660-hp. Diesel-elec.	
United States Army	2	70-ton Diesel-elec.	Vulcan Iron Wks.
United States Navy, Bureau of Supplies and Accounts	2	Diesel-elec. switch.	Vulcan Iron Wks.
United States Navy Dept.	1[4]	50-ton Diesel-elec. switch.	Atlas Car & Mfg. Co.
United States War Dept.	9	45-ton Diesel-elec. switch.	Davenport-Besler Corp.
Upper Merion & Plymouth	1	660-hp. Diesel-elec. switch.	Baldwin Loco. Wks.
Western Maryland	1	660-hp. Diesel-elec. switch.	Baldwin Loco. Wks.
Wheeling & Lake Erie	10	2-8-4	American Loco. Co.

LOCOMOTIVE INQUIRIES

Road	No. of Locos.	Type of Loco.	Builder
Louisville & Nashville	14-21	2-8-4	....
National Rys. of Mexico	20	4-8-4	....
	6	2-6-6-2	....
	6	4-8-0	....
	8	2-8-0	....

FREIGHT-CAR ORDERS

Road	No. of Cars	Type of Car	Builder
Akron, Canton & Youngstown	100	50-ton hopper	Bethlehem Steel Co.
	30	70-ton gondolas	
Central of Georgia	150	50-ton auto.	American Car & Fdry. Co.
	50	50-ton box	Pull.-Std. Car Mfg. Co.
Central of New Jersey	1,000	70-ton gondola	Bethlehem Steel Co.
Chesapeake & Ohio	1,000	50-ton hopper	American Car & Fdry. Co.
	1,000	50-ton box	Pull.-Std. Car Mfg. Co.
Chicago, Rock Island & Pacific	200	Gondola	American Car & Fdry. Co.
Clinchfield	5	70-ton covered hopper	American Car & Fdry. Co.
	7	Cabooses	
Delaware, Lackawanna & Western	600	50-ton box	American Car & Fdry. Co.
	250	Gondola	
	400	50-ton box	Magor Car Corp.
Florida East Coast	30	Gondola	American Car & Fdry. Co.
	30	Hopper	
Litchfield & Madison	50	Hopper	Gen. Amer. Trans. Corp.
National Rys. of Mexico	1,000	50-ton box	Magor Car Corp.
New York, Chicago & St. Louis	900	Box	Gen. Amer. Trans. Corp.
	250	50-ton hopper	American Car & Fdry Co.
New York, New Haven & Hartford	50	Cabooses	Pull.-Std. Car Mfg. Co.
Norfolk & Western	25	70-ton gondola	Ralston Steel Car Co.
Reading	500[5]	70-ton gondola	Bethlehem Steel Co.
	50	Cement	Co. shops
St. Louis Southwestern	500[6]	Freight	Co. shops
Seaboard Air Line	500	50-ton box	Pull.-Std. Car Mfg. Co.
	100	50-ton flat	Greenville Steel Car Co.
	50	70-ton cement	Bethlehem Steel Co.
	100	70-ton hopper	
Southern Pacific	700	50-ton box	Pull.-Std. Car Mfg. Co.
	700	50-ton box	Pressed Steel Car Co.
	700	50-ton box	American Car & Fdry. Co.
	150	70-ton hopper	
	500	50-ton box	Mt. Vernon Car Mfg. Co.
	700	50-ton gondola	Bethlehem Steel Co.
	300	70-ton flat	Pacific Car & Fdry Co.
	200	12,000-gal. tank	Gen. Amer. Trans. Corp.
	50	8,000-gal. tank	
Union Pacific	2,500	Underframes	Mt. Vernon Car Mfg. Co.
United States Army	50	10,000-gal. tank	Gen. Amer. Trans. Corp.
United States Navy	2	70-ton flat	Haffner-Thrall Car Co.
	20	50-ton flat	
	2	100-ton flat	
	26	30-ton flat	
Wabash	100	70-ton gondola	Co. shops
Western Maryland	4	Depressed-center flat	Co. shops

(Continued on next left-hand page)

Freight-Car Inquiries

Road	No. of Cars	Type of Car	Builder
Missouri Pacific	1,000	Box	....
	50	Flat	....
	500	Hopper	....
	50	Coal	....
	250	Box	[7] ....
	450	Coal	
	50	Flat	
	100	Box	[8] ....
	300	Coal	
	50	Flat	
	100	Box	[9] ....
	150	Coal	

Passenger-Car Orders

Road	No. of Cars	Type of Car	Builder
Atchison, Topeka & Santa Fe	7	Storage-mail	Edw. G. Budd Mfg. Co.
	8	Dining	
	6	Club-lounge	
	16	Chair	
Florida East Coast	3	Coach	[10] Edw. G. Budd Mfg. Co.
	1	Observation	
	1	Dining	
	1	Passenger-baggage	
Illinois Central	2	Lounge	Co. shops
Pennsylvania	12[10]	Coach	Edw. G. Budd Mfg. Co.
Pullman Co.	170[11]	Sleeping	Pull.-Std. Car Mfg. Co.

[1] For fast heavy freight service. Delivery expected middle or latter part of 1942. Estimated cost $3,250,000.

[2] For passenger service.

[3] Purchase authorized by the court, also the purchase of five 1,000-hp. Diesel-electric locomotives. Cost of 15 steam locomotives, $2,692,500; five Diesel-electric locomotives, $392,500.

[4] Cost, $26,398.

[5] Order not confirmed.

[6] Construction authorized by the district court; cost, $1,748,000.

[7] For Gulf Coast Lines.

[8] For International-Great Northern.

[9] For Missouri Illinois.

[10] To operate in conjunction with 16 Atlantic Coast Line cars reported in July issue for through passenger service from New York to Florida.

[11] For the following trains: *Overland Limited* (Southern Pacific-Union Pacific-Chicago & North Western)—78 cars, 60 containing 4 double bedrooms, 6 roomettes and 6 sections; and 18 with 2 drawingrooms, 4 compartments and 4 double bedrooms; *Panama Limited:* (Illinois Central)—20 cars, 12 with 4 double bedrooms, 6 roomettes, and 6 sections; 2 with 2 drawing-rooms, 4 compartments, and 4 double bedrooms; 2 with 18 roomettes; 2 with 3 double bedrooms, 1 compartment, 1 drawing-room, and a buffet-lounge; and 2 with 2 double bedrooms, 1 drawingroom, 2 compartments, and a lounge-observation; *Golden State Limited:* (Southern Pacific-Chicago, Rock Island & Pacific)—24 cars, 11 with 2 drawingrooms, 4 compartments, and 4 double bedrooms; and 13 with 4 double bedrooms, 6 roomettes, and 6 sections; *Chief* and *Super-Chief*, (Atchison, Topeka & Santa Fe)—12 cars, 4 with 2 drawingrooms, 4 compartments, and 4 double bedrooms; and 8 with 4 double bedrooms, 6 roomettes, and 6 sections. For general service on Santa Fe trains, there will also be 26 cars containing 4 double bedrooms, 6 roomettes, and 6 sections; and 6 with rooms and an observation-lounge. In addition, four cars of the new equipment will be assigned to the Missouri Pacific, each containing 4 double bedrooms, 6 roomettes and 6 sections. Practically all of the cars will be of high tensile, alloy steel, of the welded girder type and air-conditioned.

Car Building Lags Says Budd

More efficient use of existing railroad facilities holds the possibility of increasing, by 25 per cent, the carrying capacity of the railroads and of avoiding a transportation bottleneck that might occur during the expanding business of the emergency, Ralph Budd, transportation commissioner of the advisory commission to the Council of National Defense, told a meeting of directors of the American Short Line Railroad Association at Chicago on July 14. Maximum use of the transportation plant, he indicated, is particularly important in view of the fact that the car building and repair program has slowed down because there has been some difficulty in securing materials.

Orders for repair parts are not being filled promptly and stocks of repair parts are being depleted through inability of manufacturers to obtain material, he said. Car and locomotive builders, he continued, are not affected by material delays to the same extent as shops making repairs. He warned against delaying car and locomotive building, pointing out that car builders are already behind about 7,500 cars on their orders. At the rate of the present interruptions due to shortage of material, the railways may fall 20,000 cars short of the program set up for completion by October 1. Unless material is released for railway use, he said, the program will fall down worse in the future because, for the year ending October 1, 1942, the railways had hoped to add 120,000 cars to their ownership. When retirements are included, this would mean a 160,000 car program between October 1, 1941, and October 1, 1942.

"The problem of providing adequate transportation in such times as these," Mr. Budd said, "is one of joint interest and responsibility, and can be solved best by the cooperation of all parties [the users of cars as well as the carriers] who must share that responsibility."

Speaking of car utilization, Mr. Budd continued: "Increased speed while on the road is not so important as maintaining a continuous movement. This is apparent when we remember that the average freight car is actually moving in trains only about 10 per cent of the time, or a little over 2½ hours out of the 24. Obviously, there is opportunity to save many more car days by avoiding some of the lost time during the other 21½ hours than by running the already high-speed trains still faster for the 2½ hours they are moving the cars.

"Sympathetic consideration has been given to the appeals for priorities which will permit suppliers to fill railway orders, but the necessary action to bring deliveries is exceedingly slow. Transportation must be recognized as equally vital with any other part of the defense effort, and the time has come when such recognition must be expressed in necessary materials. The matter is not within my control or that of the railroads. It is not a question of their failure to place orders, nor their ability to pay for the goods."

Midget Gasoline-Propelled Locomotives for Army

"Midget locomotives, as easily operated as automobiles, yet able to pull trains of 15 loaded freight cars at a speed of 15 miles an hour, are being delivered to Army posts throughout the country," said a recent statement from the War Department.

Twenty-five of the locomotives already are working for the Army. Although the general plan is to use the midgets on standard gauge tracks, experimental tests at Fort Dix, N. J., "revealed they were adaptable to narrow gauge as well." There are many practical time-saving uses for the locomotive, according to Quartermaster Corps authorities.

OPM Moves to Recover Nickel Steel Scrap

A movement on the part of the Office of Production Management to convince railroads and other large users of alloy steels, particularly nickel steel, that usable alloy scrap should be segregated and returned to the steel industries for remelting were discussed at Washington, D. C., on July 8, at a meeting sponsored by the National Conference of Business Paper Editors. Attending the conference were Dr. C. H. Herty, Jr., research engineer, Bethlehem Steel Company, who is chairman of the new scrap conservation sub-committee of the American Iron & Steel Institute's Defense Committee; H. Leroy Whitney, chief of OPM's Nickel Section; D. A. Uebelacker, chief of OPM's Nickel Section; C. G. Holmquist of the office of Price Administration and Civilian Supply; T. H. Wickenden, assistant manager of the development and research department, International Nickel Company, and Robert A. Wheeler, advertising manager, Nickel Alloy Steel Division, International Nickel Company.

Mr. Uebelacker estimated that the present total nickel demand is running at about the rate of 21 million pounds per month. Of this he said 12½ million pounds per month are required to satisfy A rating priorities. At the present time there is available for distribution in the United States about 15 million pounds per month, leaving a shortage of about six million pounds per month of unsatisfied demand.

The scrap-recovery movement was started in the belief that a large supply of usable alloy scrap can be made available for remelting if it can be located and the using industries can be induced to take measures to effect an adequate segregation of alloy scrap material. A letter has been sent out to using industries by OPM suggesting a basis for segregation and grading of alloy scraps, first according to the amount of the principal alloying element and, thence, according to carbon content and the amount of stabilizing elements and elements added for machinability. These grades are grouped into two main classes—stainless steels and low-alloy steels—and the principal alloying elements involved are nickel, chromium, and molybdenum. Accompanying the letter to the using industries is a copy of a price sched-

(*Continued on next left-hand page*)

ule issued by OPACS in fixing maximum price of nickel-steel scrap and giving other information governing grading and quantity differentials.

Mr. Whitney expects most users to find that the higher prices which the properly segregated, uncontaminated alloy scrap will command will be ample economic justification for the expense involved in effecting the proper segregation.

The steel scrap conservation sub-committee of the American Iron & Steel Institute is developing plans for finding out where the alloy scrap is located, how much of it there is, and what facilities are available for its proper preparation, where processing is necessary before shipment.

Equipment Purchasing and Modernization Programs

Baltimore & Ohio.—Division 4 of the Interstate Commerce Commission has modified its Equipment Trust Certificate order of November 19, 1940, in Finance Docket No. 130079, so as to permit this company to substitute 274 70-ton, 53 ft. 1½ in. all-steel gondola cars in place of 250 70-ton, 66 ft. 1½ in. all-steel gondola cars as originally contemplated.

Cambria & Indiana.—The Cambria & Indiana has placed an order for repairs to 400 hopper cars with the Bethlehem Steel Company.

Canadian Pacific.—A contract has been awarded Couture and Toupin, Winnipeg, Man., for the construction of a scrap reclaiming building at Weston shops. The work involves the construction of a brick and concrete building 50 ft. x 96 ft. x 15½ ft., at a cost of $18,000.

A contract on a cost plus basis has been awarded to C. M. Miners Construction Company, Ltd., Saskatoon, Sask., for the installation of a 90-ft. turntable at Sutherland, Sask.

Chicago, Burlington & Quincy.—The Burlington has asked the Interstate Commerce Commission for authority to assume liability for $9,387,000 of 1½ per cent equipment trust certificates, maturing in seven annual installments of $1,341,000 each on August 1 in each of the years from 1942 to 1948, inclusive. The proceeds will be used as part of the purchase price of new equipment costing a total of $11,043,530 and consisting of 2,000 40-ft. 6-in., 50-ton steel frame, double-sheathed box cars with steel outside sheathing; 500 50-ft. 6-in., 50-ton steel frame, double-sheathed box cars with steel outside sheathing; 175 50-ft. 6-in., 50-ton steel frame, double-sheathed automobile cars with steel outside sheathing with auto loaders; 50 29-ft. 3-in., 70-ton all-steel, covered hopper cars; 100 65-ft. 6-in., 70-ton, all-steel gondola cars; 250 34-ft. 3-in., 55-ton, all-steel hopper cars; 400 53-ft. 6-in., 50-ton, all-steel flat cars; 200 40-ft. 6-in., 40-ton steel frame stock cars; and 250 40-ft. 8-in., 70-ton all-steel ballast cars, making a total of 3,925 cars. Orders placed with the company shops were announced in the March issue.

Gulf, Mobile & Ohio.—The G. M. & N. has asked the Interstate Commerce Commission for authority to assume liability for $2,175,000 of 2.4 per cent equipment trust certificates, maturing in 15 equal annual installments of $145,000 on August 1 in each of the years from 1942 to 1956, inclusive. The proceeds will be used as a part of the purchase price of new equipment costing a total of $2,853,000 and consisting of 800 40-ton, 40-ft. 6-in. box cars; 150 50-ton twin, self-clearing hopper cars; and 50 40-ton, 40-ft. 6-in. automobile box cars. Orders for this equipment were announced in the July issue.

When filing this petition the G. M. & N. pointed out that while it has equipment sufficient to handle normal business it considers it its duty to provide itself with the facilities that will enable it to do its part in supporting the government's preparation for defense.

Illinois Central.—The Illinois Central has asked the Interstate Commerce Commission for authority to assume liability for $6,920,000 of equipment trust certificates, maturing in 20 semi-annual installments of $346,000, beginning September 1, 1941. The proceeds will be used as part of the purchase price of new equipment costing a total of $7,699,166 and consisting of 1,000 40-ton box cars; 1,000 50-ton hopper cars; 200 40-ton refrigerator cars; 100 70-ton covered hopper cars, and 100 50-ton flat cars. Orders for this equipment were announced in the May issue.

Missouri-Kansas-Texas. — An elaborate car rehabilitation program calling for the rebuilding of more than 2,000 freight cars is being undertaken by the M-K-T at its Denison shops. Included are 1,500 box, 500 gondola and 30 caboose cars. A force of 100 men are already at work on the construction of the first 10 cabooses, 2 of which are already in service.

Following completion of the cabooses, Denison shop forces will sandblast and paint 200 hopper cars. This work will be done pending the arrival of materials and supplies needed for the car building program.

Of the box cars to be rebuilt, 1,000 are of the 76000 series, which were built by the American Car & Foundry Company at St. Charles, Mo., in 1923. Many of the remaining 500 box cars are of the 96000 series, built at Denison in 1926. The 76000 series cars are 80,000-lb. capacity units with steel frames, posts, braces and roofs and with longitudinal wood siding, mounted inside the steel braces. The 96000 series are of the same construction but are of 100,000-lb. capacity.

New York Central.—Five stalls of the enginehouse on the Big Four at Bellefontaine, Ohio, will be extended to accommodate the installation of a 100-ton and a 50-ton drop table, and a monorail crane. The contract for the enginehouse extension has been awarded the Walsh Construction Company, and for the drop tables, the Whiting Corporation. The cost of the project, including sewer and water line changes and a fan and heater room, is estimated at $102,000.

Northern Pacific.—A contract has been awarded the J. W. Bailey Construction Company, Seattle, Wash., for the construction of a three-track wood frame rectangular enginehouse with a machine bay, a wood frame office and store building, and a concrete cinder pit at Easton, Wash. In connection with this work, track rearrangements and changes to water facilities will be completed by company forces.

Wabash.—The Wabash has asked the district court for permission to purchase materials for the construction of 100 freight cars in company shops at a cost of $350,000.

Western Maryland. — The Western Maryland has asked the Interstate Commerce Commission for authority to assume liability for $1,900,000 of 2⅛ per cent equipment trust certificates, maturing in 10 equal annual installments of $190,000 on August 1 in each of the years from 1942 to 1951, inclusive. The proceeds will be used as a part of the purchase price of new equipment costing a total of $2,204,000 and consisting of 200 all-steel, 50-ton box cars with chilled iron wheels; 300 all-steel, 50-ton hopper coal cars, with one-wear steel wheels; 200 all-steel, 50-ton gondola cars with wood floors and chilled iron wheels; and 25 50-ton flat cars with chilled-iron wheels. Orders for this equipment were announced in the July issue.

Western Pacific.—The Western Pacific has asked the Interstate Commerce Commission for authority to assume liability for $2,650,000 of equipment trust certificates, maturing in 10 equal annual installments of $265,000 on August 1 in each of the years from 1942 to 1951, inclusive. The proceeds will be used as part of the purchase price of new equipment costing a total of $3,588,560 and consisting of three 5,400 hp. Diesel-electric freight locomotives; 350 50-ton, 40-ft. box cars; 300 50-ton, 50-ft. flat cars, and four stainless steel-sheathed, streamline chair cars. Orders for this equipment were announced in the July issue.

OPACS Gives Preferential Status for Locomotive and Car Materials

ACTION "to relieve a critical shortage of locomotives of all kinds" was taken by the Office of Price Administration and Civilian Supply on July 7 when it made public an allocation program "giving preferential delivery status" to materials and equipment essential to locomotive construction. On the same day, OPACS also acted "to secure adequate transportation facilities for the traveling public," issuing another allocation program providing preferential status on materials and equipment used in the construction of cars and buses "for urban or interurban lines."

The locomotive materials program set forth that "there is a critical shortage in the nation's locomotives"; it is applicable to material and equipment entering into "railroad, mine and industrial locomotive construction—steam, electric or Diesel." Likewise the program in connection with passenger equipment for urban and interurban lines was based on a finding that "there is a critical shortage in the nation's coaches and rail-cars." These latest moves place the equipment involved in the same OPACS class as the materials for freight-car construction covered in a previous allocation program issued June 10. In other

(Continued on next left-hand page)

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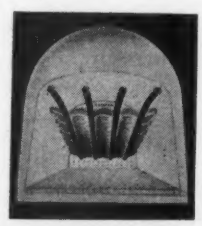

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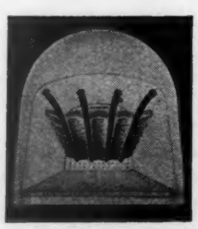

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words, as it is stated in the locomotive program, "all deliveries of material and equipment necessary for the construction of locomotives shall be given preference over all material and equipment going into any other civilian use, subject, however, to a prior preference to deliveries for all such material and equipment as may be required under contracts with the United States or any department or agency thereof."

The civilian allocation program for freight cars issued on June 10 will, according to Leon Henderson, administrator of OPACS, "affect particularly the distribution of available supplies of steel and its products since they constitute a major part of the materials required in freight-car construction. It is estimated that an average of 20 tons of steel are required for each freight car built. Completion this year of all the freight cars on order May 1 would require around 1,400,000 tons of steel."

OPACS After Wheel Builders

Railroad car-wheel builders were asked during the latter part of June to withdraw "the substantial price increase they had proposed to put in effect July 1" and, instead, to meet for discussions on the matter with representatives of the Office of Price Administration and Civilian Supply in Washington.

The request was contained in a letter sent June 23 to 16 car wheel manufacturers by Leon Henderson, OPACS administrator, who said his office could continue its present policy of inviting voluntary co-operation, rather than formal controls, "only so long as individual businesses are willing to assume the responsibility of maintaining price stability." Confidence was expressed by the administrator that the need for further action in the present situation could be avoided. The car-wheel industry has had a position of "strategic importance" in the defense effort, the letter pointed out, in addition to its place in the general industrial economy.

D. & R. G. W.—Climax Molybdenum Party

On July 17 and 18, the Denver & Rio Grande Western, in conjunction with the Climax Molybdenum Company, held "open house" for a party of railway engineers and manufacturers' representatives from various parts of the country who were invited to make a thorough inspection of the railroad's test laboratory at Denver, Colo., and the world's largest Molybdenum mine at Climax, Ohio. At the test laboratory, which is now being enlarged to accommodate a substantially increased volume of work, R. McBrian, engineer of tests, and his assistants explained the use of the various units of modern laboratory equipment, and described current test work, such as Thermoflux determination of laminated sections in boiler plate and firebox steel; Magnaflux tests of locomotive and car parts; dampening capacity tests as a measure of the aging of metals; and use of polarized light to show stress patterns in plastic models. Physical tests of alloy firebox steels at controlled high temperatures indicate that the presence of molybdenum as an alloy has a definite tendency to give improved physical properties as compared with carbon steel at the high temperatures common in modern locomotive boiler operation.

On Friday, July 18, the inspection party, under the direction of D. R. Carse, New York representative of the carbon Molybdenum Company, and E. R. Young, metallurgical engineer, motored to the company mine at Climax and inspected the extensive operations whereby 12,000,000 lb., of molybdenum concentrate were produced in 1940. It is expected that this production will be stepped up to 20,000-000 lb. in 1941. The magnitude of the highly-mechanized process by which such large production figures are realized may be appreciated from the fact that molybdenum constitute only about six per cent by weight of the ore as mined.

I. C. C. Organization Changes

The Interstate Commerce Commission has announced that Commissioner Miller has been assigned to Division 3 in lieu of Commissioner Alldredge. Division 3 now consists of Commissioners Mahaffie, Miller and Johnson, "except that Commissioner Patterson shall serve in lieu of Commissioner Miller with respect to matters arising under Section 25 (a)-(g), inclusive, of the Interstate Commerce Act, Railroad Retirement Act of 1937, Carriers Taxing Act of 1937, Railroad Unemployment Insurance Act, Railway Labor Act, Safety Appliance Acts, Locomotive Inspection Act, Ash Pan Act, Accident Reports Act, Hours of Service Act, Block Signal Resolution of June 30, 1906, Sundry Civil Appropriation Act of May 27, 1908, and Medals of Honor Act."

OPM Issues Priorities for Locomotive Builders; None for Passenger Cars

To alleviate problems caused by a serious shortage of locomotives, the priorities division of the Office of Production Management has issued two blanket preference rating orders—designed to facilitate both the construction of locomotives and their repair. A preference rating of A-3 will be granted to an initial list of 10 locomotive builders and also to about sixty repair plants, it was stated.

The two orders are similar in form to the blanket preference rating granted to freight-car builders as noted in the July issue, page 295. One of the new orders grants a rating for delivery of material entering into the repair and rebuilding of steam, electric or Diesel locomotives, whether for railroad, mining or industrial use. The other order grants a rating for delivery of materials entering into the construction of specified locomotives now scheduled by the builders.

Each producer or supplier granted the use of the new rating may apply it to deliveries of material entering into construction or repairs by executing a copy of the appropriate order and serving it on his suppliers. After the rating has been applied the first time, additional orders may be covered merely by citation of the rating granted originally, it was pointed out.

Use of the blanket ratings will, in the opinion of the priorities division, eliminate a great deal of paper work which is at present involved in making separate applications for ratings on each individual contract or order placed.

No OPM preference ratings will be issued for steel for passenger-car construction, it having been determined that there is no immediate necessity for such action.

Aluminum Production Expanding

The use of aluminum, which has found its way extensively into passenger-car construction both as trim and as the primary structural material, is now confined exclusively as a raw material of the defense industries.

In 1939, when the Aluminum Company of America was sole producer of primary aluminum, its total production was 327 million pounds. This company alone has under way a program of expansion which will have increased its output to 720 million pounds, or more than doubled, by mid-summer of 1942. Other plants to be owned by the government have been projected which will raise the total capacity of the aluminum producing industry to 1,400 million pounds when they have been completed. Three of these plants will be operated by the Aluminum Company of America; one by the Union Carbide and Carbon Company; one by the Reynolds Metal Company; one by the Bohn Aluminum & Brass Company, and one by the Olin Corporation. These seven federally owned plants are located adjacent to various large water-power sources, most of them built by the government.

Conferences with Engineers and Firemen Break Up Over Diesel Demands

Conferences took place during June at Chicago between a committee representing the Western railways and committees representing the Brotherhood of Locomotive Engineers and the Brotherhood of Locomotive Firemen and Enginemen on the demands which the engineers made on March 18, 1939. The demands of the engineers call for rates of pay based upon horsepower of Diesel locomotives instead of weights on drivers and for an assistant engineer in the engine rooms of certain types of Diesel locomotives. The demands which the firemen made on May 10, 1941, involve higher pay on Diesel and coal-burning locomotives and a fireman-helper on each unit of locomotives. The conferences broke up on July 3, due to the continued demands of the engineers and firemen for the employment of extra men on Diesel-electric locomotives.

"We see neither reason nor justice in the

demands for the employment of additional and unneeded men on Diesel locomotives," said F. G. Gurley, chairman of the Western Carriers' Conference Committee. "The demands of the engineers and firemen would require, on a Diesel such as that used on the transcontinental City of San Francisco, the employment of seven enginemen—one engineer, three 'assistant engineers' and three firemen. This train is now being operated safely and efficiently with two enginemen—one engineer and one fireman.

"The City of San Francisco, in its journey from Chicago to the Coast, runs over 15 so-called 'operating districts.' Engine crews are changed for each operating district. Thus, under the present demands, 105 enginemen would be required to handle the locomotive on a trip requiring only 39 hours and 45 minutes. In view of the fact that 15 engine crews are used in a period of less than 40 hours, it is obvious that these men, on the average, now work only between two and three hours a day; yet they receive a minimum of 8 hours' pay. The 105 men, who would be required under the present demands to handle this train in one direction, represent an increase of 75 over the present number required. All that these extra employees would do would be to ride, to draw their pay, and to increase the cost of rail transportation.

"We have been ready and willing, as a basis for disposing of these demands, to discuss with these men changes in the basis upon which their present daily rates of pay are established. We see no justification, however, for the employees to attempt to secure a wage increase through a change in the basis on which they are paid. This is particularly true when there are now before us demands for an increase of 30 per cent in pay on top of this other wage increase. In other words, the engineers and firemen are demanding a compound increase in pay—an increase on top of another increase.

"We have offered to attempt a disposition of these demands by a change in the present method of fixing rates of pay for engineers and firemen on Diesel-electric locomotives, but only upon a sound and reasonable basis, and not as a wage increase in disguise. The employees, however, have stated that no change in the basis of pay for operating Diesel-electric engines would cause them to withdraw their demands for the additional and unnecessary personnel.

"Certainly, no group of railroad officers, with justice to themselves or to the people who are entitled to demand from them reasonably intelligent and courageous management of the properties entrusted to them, can agree to any such proposals."

Supply Trade Notes

Herbert J. Watt has been appointed manager of sales, western area, for the Carnegie-Illinois Steel Corp., with headquarters in Chicago. Mr. Watt will coordinate sales activities of the company's offices at Chicago; Denver, Col.; Detroit, Mich.; Indianapolis, Ind.; Milwaukee, Wis.; St. Louis, Mo., and St. Paul, Minn.

◆

T. H. Murphy has been appointed superintendent of Diesel power of the American Locomotive Company with headquarters at Schenectady, N. Y. Mr. Murphy

T. H. Murphy

graduated from the University of Virginia with a degree in electrical engineering in 1923. From 1923 to 1924, he worked on the special test course and attended the engineering school of the Westinghouse Electric & Manufacturing Co., subsequently entering that company's railway engineering department. From 1926 to 1927 he acted as special engineering representative at the J. G. Brill plant at Philadelphia, Pa. Later, he was stationed at the South Philadelphia plant of the Westinghouse Electric & Manufacturing Co. in connection with Diesel locomotive work, where he remained until 1936. In October, 1936, after a few months of shop engineering development work at the Weirton Steel Company, he entered the employ of the American Locomotive Company, where he engaged in special work on Diesel locomotives in the engineering department at that company's New York office. Mr. Murphy was transferred to the Schenectady, N. Y., plant early in 1941.

◆

Stewart McNaughton has been appointed general sales manager of the Locomotive Division of The Baldwin Locomotive Works, in charge of all steam and Diesel locomotive sales. Mr. McNaughton was born in Philadelphia, Pa., and obtained his education in the Central High

S. McNaughton

School and the Franklin Institute of that city. He became associated with The Baldwin Locomotive Works in 1899 as a mechanical draftsman and for the next fifteen years devoted his time to the various phases of locomotive design and engineering. In 1915 he entered the sales department as manager of the locomotive spare and repair parts activities of the company, and in 1919 was given general supervision over steam locomotive sales.

◆

John S. Hutchins, who has been in charge of sales in the Chicago district for the Ramapo Ajax division of the American Brake Shoe and Foundry Company, New York, has been promoted to district

John S. Hutchins

sales manager for this division in charge of the entire middle west territory, with headquarters at Chicago, to succeed Paul Hoffman, retired. Mr. Hutchins was born at Arlington, Mass., on December 30, 1904, and after attending Yale University, entered the employ of Ramapo Ajax at Chicago in September, 1925. Two years later he was transferred from the plant to the sales department and in 1930 was moved to the Cleveland office. In 1933 he was placed in charge of sales in the Chicago district.

◆

Pullman-Standard Car Manufacturing Company.—*Andrew Christian-*

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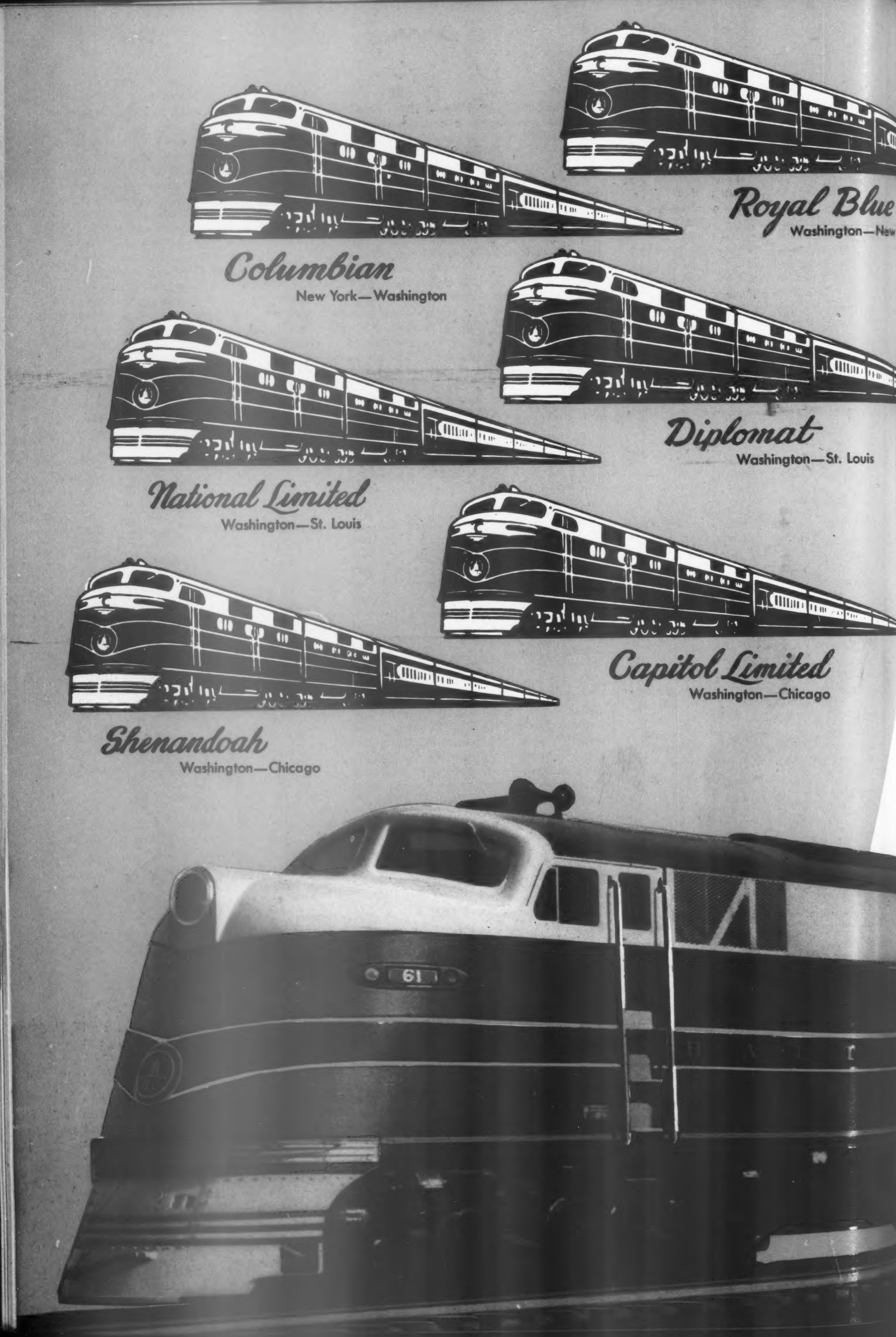

Royal Blue
Washington—New
Columbian
New York—Washington
Diplomat
Washington—St. Louis
National Limited
Washington—St. Louis
Capitol Limited
Washington—Chicago
Shenandoah
Washington—Chicago
61


B&O
The Ambassador
Between Washington–Pittsburgh–Toledo–Detroit
JOINS THE B&O DIESEL-POWERED FLEET OF LUXURY TRAINS
"THE AMBASSADOR" now provides the first Diesel-powered passenger service between the Nation's Capitol—Pittsburgh, the steel center of the world—Detroit and Toledo, the heart of the automotive industry.
Passenger travel on the B & O, day or night, means personalized service—luxury—comfort—quiet—smooth starts and stops—speed with maximum safety.
"PASSENGER SERVICE CAN BE PROFITABLE"
ELECTRO-MOTIVE CORPORATION
SUBSIDIARY OF GENERAL MOTORS
LA GRANGE, ILLINOIS, U. S. A.
LOCOMOTIVES

son, consulting engineer of Pullman-Standard, Chicago, has been granted a six-months leave of absence. The duties of his office are being assumed by *E. W. Test,* assistant to the president in charge of engineering and research.

◆

HORACE M. WIGNEY has been appointed assistant vice-president of the equipment specialties division of the Union Asbestos and Rubber Company, Chicago. For the last year Mr. Wigney has engaged in special work on the Pacific Coast for the City Ice & Fuel Company of Cleveland, Ohio. For twelve years, prior to 1940 he served as vice-president and general manager of Safety Refrigeration, Inc., a subsidiary of the Safety Car Heating and Lighting Company, New York. For a number of years he also was general superintendent of the Merchants Despatch Transportation Corporation at Rochester, N. Y., and superintendent of transportation of the Pacific Fruit Express Company, from 1907 to 1915.

◆

MACHINERY & ALLIED PRODUCTS INSTITUTE.—*George Terborgh* has been elected secretary of the Machinery & Allied Products Institute, national federation of machinery manufacturers, to succeed *Alexander Konkle,* who has resigned to re-enter private business. Mr. Terborgh had been senior economist of the Board of Governors of the Federal Reserve Bank at Washington, D. C.

◆

IRON & STEEL PRODUCTS, INC.—*Paul G. Cheatham, Jr.,* has been appointed Mexican representative of Iron & Steel Products, Inc., Chicago, with headquarters at Mexico City, D. F., to succeed *P. C. Morales,* who has resumed the position of general superintendent of motive power and machinery of the National Railways of Mexico, from which he resigned in 1935.

◆

OAKITE PRODUCTS, INC.—*Bennett C. Browning,* special representative of Oakite Products, Inc., New York, with headquarters at Chicago, has been appointed manager of the railway service division, with the same headquarters. *Hobart F. Cooke* and *Frank C. Lipcomb,* who have represented the industrial division in the Omaha and in the Tennessee-Alabama territories, have been transferred to the enlarged railway service division at Chicago.

Obituary

OTTO V. KRUSE, general sales manager of the Baldwin Locomotive Works, died at his home in St. Davids, Pa., July 1. He was 54 years of age. Mr. Kruse graduated from Cornell University in 1909 with the degree of Civil Engineer. He was active in the hydro-electric industry up to the year of 1917, at which time he became consulting engineer to the Larner Engineering Company and the William Cramp & Sons Ship and Engine Building Co. He was subsequently appointed general sales manager of the miscellaneous machinery business of the Cramp company. In 1931 the Baldwin Locomotive Works acquired this business and Mr. Kruse later became general sales manager and finally assistant manager of the division of this business known as the Baldwin-Southwark Corporation. He became general sales manager of the Baldwin Locomotive Works in 1939.

Otto V. Kruse

◆

GEORGE H. JONES, one of the founders of Inland Steel Co., died July 6 in his home in Chicago at the age of 85. In 1893, he joined in organizing Inland Steel Co. Mr. Jones' first position with the company was that of vice-president; he was the chief executive officer and was also in charge of sales. He became the second president in 1898 and served in that capacity until 1906. He served in other executive positions until 1921 and had continued as a director of the company since that time.

◆

EDWARD H. DICKINSON, assistant to the vice-president of sales, American Locomotive Company, died July 9 at his home in Ridgewood, N. J.

◆

DUDLEY BREWSTER BULLARD, vice-president of the Bullard Company of Bridgeport, Conn., who died on June 10, as announced in the July issue of the *Railway Mechanical Engineer,* received his early engineering education as an apprentice in the plant of his father, who founded the Bridgeport Machine Tool Works which later became the Bullard Company. After several years spent in the machine shop he was advanced to the drafting room and subsequently appointed superintendent of the plant. From this position he became chief engineer and finally vice-president in charge of engineering. Mr. Bullard was a member of the A. S. M. E. and had served as chairman of the Bridgeport chapter from 1931 to 1932. He was also a member of the Bridgeport Engineers' Club and its president in 1930.

Dudley Brewster Bullard

Personal Mention

General

EMIL C. ANDERSON, mechanical engineer of the Chicago, Burlington & Quincy at Chicago, retired on July 1, after 47 years' railway service.

J. F. JENNINGS, superintendent of equipment of the Michigan Central with headquarters at Detroit, Mich., retired on June 30 after 50 years of service.

REVELLE W. BROWN, vice-president (operations and maintenance) of the Reading and its affiliated Central of New Jersey, has been elected president of the Lehigh Valley. Mr. Brown was born August 5, 1883, at Carlyle, Ill. After attending public schools and Carlyle high school, he entered railroad service July 19, 1901, as a laborer on the Baltimore & Ohio. Later, he was successively a fireman, a locomotive engineer, an air-brake instructor, and assistant road foreman of engines, Illinois division. After several further positions in the motive power field he held various positions in the operating department of the B. & O., becoming general manager of the Central of New Jersey at New York on December 1, 1930. Six months later he was appointed also a vice-president, and on December 27, 1935, became vice-president in charge of operation and maintenance, Reading and Central of New Jersey.

A. H. REAM, superintendent of motive power and equipment of the Pittsburgh & Shawmut, with headquarters at Brookville, Pa., has retired from active duty at his own request, after 48 years of railroad service, 25 years of which has been in the service of the Pittsburgh & Shawmut.

W. G. REID, master mechanic of the Rio Grande division of the Southern Pacific with headquarters at El Paso, Tex., has been appointed assistant superintendent of motive power with headquarters

(*Continued on next left-hand page*)

at El Paso. Mr. Reid entered the employ of the Southern Pacific in 1903 as a machinist apprentice at Tucson, Ariz., and in 1907-8 was a machinist on the Southern Pacific of Mexico at Guaymas. From 1908 to 1913 he served as a machinist on the Arizona Eastern at Globe, Ariz. In the latter year he was promoted to foreman and later to general foreman on that road. In 1918 he became trainmaster at Globe and,

W. G. Reid

a short time later, master mechanic at Phoenix, Ariz. In 1924 Mr. Reid was transferred to El Paso.

Mathew Roy Benson, assistant superintendent of equipment of the Michigan Central at Detroit, Mich., has been appointed superintendent of equipment, with headquarters at Detroit. Mr. Benson was born at St. Thomas, Ont., on May 31, 1889, and entered railway service on July 10, 1906, as an apprentice in the shops of the Michigan Central at St. Thomas.

Mathew Roy Benson

On December 1, 1906, he became a machinist apprentice in the locomotive shops, and four years later was appointed a machinist. From March 30, 1911, to May 3, 1913, Mr. Benson worked for several automobile industries at Detroit, and on the Canadian Pacific, returning to the Michigan Central on the latter date as a machinist. On October 1, 1913, he was promoted to piecework inspector, and on April 1, 1916, became wrecking shop foreman. Five months later he became chief piecework inspector, and on October 1, 1920, was advanced to the position of general foreman. Mr. Benson was appointed superintendent of shops at Jackson, Mich., on April 16, 1925; master mechanic at St. Thomas on February 1, 1926, and assistant superintendent of equipment on February 1, 1941.

Charles A. Gill, general manager of the Reading and Central of New Jersey, with headquarters at Reading, Pa., was elected vice-president in charge of operation and maintenance at a special meeting of the board of directors on July 15, to succeed R. W. Brown, who has been elected president of the Lehigh Valley. Mr. Gill was born at Buffalo, N. Y., on January 19, 1884. After receiving a public school education in Baltimore, Md., he entered the service of the Baltimore & Ohio at the Riverside shops in 1897, later becoming a machinist apprentice. Between 1901 and 1909 Mr. Gill served as a machinist on the Northern Central, foreman on the Chicago, Burlington & Quincy at Sheridan, Wyo., and foreman on the Northern Pacific at Livingston and Missoula, Mont., and Wallace, Idaho. In 1909 Mr. Gill again became affiliated with the Baltimore & Ohio as an enginehouse foreman at Washington, Ind. He then became master mechanic on the Cincin-

Charles A. Gill

nati, Hamilton & Dayton, Dayton & Union (now both part of the Baltimore & Ohio), and Chicago & Illinois Western in 1912. In 1913 Mr. Gill became general master mechanic of the Maryland district of the Baltimore & Ohio and four years later was appointed superintendent motive power of the eastern lines. In 1931 Mr. Gill was loaned by the Baltimore & Ohio to the Russian government for the purpose of rehabilitating the motive power and railroad shops of that country. He remained in Russia for a year, during which time he virtually reorganized the rail transportation of that country. In 1932 Mr. Gill was appointed assistant chief of motive power of the Baltimore & Ohio and special representative to the operating vice-president of the Reading. Later in 1932 he was appointed superintendent motive power of the Reading and the Central of New Jersey, of which roads he became general manager in 1936. Mr. Gill is a member of the executive committee of the New York Railroad Club. He was president of the club during 1937-1938.

Warren P. Hartman has been appointed mechanical superintendent of the Western district of the Atchison, Topeka & Santa Fe. Mr. Hartman was born at Longmont, Colo., on February 1, 1891, and was graduated from the University of Colorado in 1914. In the same year he entered the employ of the Santa Fe as a

Warren P. Hartman

special apprentice at La Junta, Colo. After serving as apprentice instructor, erecting gang foreman at Raton, N. M., general erecting foreman at La Junta, and enginehouse foreman at Raton and Albuquerque, he was promoted to general enginehouse foreman at Albuquerque on July 10, 1924. On December 1, 1930, he was promoted to fuel supervisor at Amarillo, Tex.; on February 1, 1934, was promoted to master mechanic of the Slaton division at Slaton, Tex., and on July 6, 1934, was transferred to the Kansas City and Eastern divisions at Argentine, Kan.

James M. Nicholson, who has been appointed general assistant, mechanical department of the Atchison, Topeka & Santa

James M. Nicholson

Fe, as reported in the July issue of the *Railway Mechanical Engineer,* was born at Scranton, Kan., on February 24, 1888, and

was graduated from Kansas State College in 1912. In the following year he entered the test department of the Santa Fe and in May, 1916, became laboratory foreman. He served as fuel supervisor at Ft. Madison, Iowa, from August, 1916, to May, 1921, when he was promoted to assistant engineer of tests at Topeka, Kan. In January, 1923, he became system fuel conservation engineer at Topeka and in November, 1930, was master mechanic at Slaton, Tex. In February, 1934, he was transferred to Argentine, Kan., and on July 1, 1937, to Chicago. He was appointed mechanical superintendent of the Western district, Eastern lines, with headquarters at Topeka, on July 20, 1937, which position he held until his appointment as general assistant, mechanical department.

Frank C. Watrous, road foreman of engines of the Pittsburgh & Shawmut, has been appointed superintendent of

Frank C. Watrous

the transportation and mechanical departments, with headquarters as before at Kittanning, Pa. Mr. Watrous was born in Sheridan, Ohio, and entered railway service with the Erie as hostler and locomotive fireman at Bradford, Pa., later being employed as a fireman on the Chicago, Rock Island & Pacific. He then served with the Pittsburg, Shawmut & Northern as trainman, with the Erie as engineer on the Bradford division, and with the Pittsburg, Shawmut & Northern as engineer. He went with the Pittsburg & Shawmut as engineer when that road started independent operation on September 1, 1916, and on January 10, 1918, was appointed road foreman of engines. On November 1, 1925, at his own request, he returned to engine service. Last January he became trainmaster and road foreman of engines.

Master Mechanics and Road Foremen

C. S. Burns, division master mechanic on the Canadian Pacific at Montreal, Que., has been transferred to the Smiths Falls (Ont.) division.

E. J. Burck, master mechanic on the Michigan Central at St. Thomas, Ont., has been transferred to Jackson, Mich. A sketch and photograph of Mr. Burck appeared on page 167 of the April issue.

F. E. Russell, Jr., assistant master mechanic of the Southern Pacific at Roseville, Calif., has been appointed master mechanic, with headquarters at El Paso, Tex.

H. D. Eddy, master mechanic of the Atchison, Topeka & Santa Fe at Clovis, N. M., has been transferred to the position of master mechanic at Winslow, Ariz.

Paul J. Danneberg, master mechanic on the Albuquerque division of the Atchison, Topeka & Santa Fe at Winslow, Ariz., has been transferred to the position of master mechanic at Argentine, Kan.

E. R. Auton, assistant master mechanic of the Southern Pacific at West Oakland, Calif., has been appointed master mechanic of the Western division, with headquarters at Oakland.

B. F. Madden, assistant master mechanic of the Southern Pacific at Sparks, Nev., has been appointed master mechanic of the newly-created Shasta division, with headquarters at Dunsmuir, Calif.

W. W. Lyons, master mechanic of the Atchison, Topeka & Santa Fe at Slaton, Tex., has been transferred to the position of master mechanic at Clovis, N. M.

L. B. Johnson, general foreman of the locomotive department of the Atchison, Topeka & Santa Fe at Clovis, N. M., has been appointed master mechanic of the Panhandle & Santa Fe, at Slaton, Tex.

Car Department

Kenneth H. Carpenter, assistant superintendent of the car department of the Delaware, Lackawanna & Western, has been appointed superintendent of the car department, with headquarters as before at Scranton, Pa., succeeding the late Paul H. Mitchell, deceased. Mr. Carpenter was born at Fontanelle, Neb., on June 25, 1898, and entered railroad service in 1920 as a

Kenneth H. Carpenter

carman with the Union Pacific at Omaha, Neb., in which capacity he served until 1922, when he went with the Missouri Pacific in a similar capacity. He served with the latter road until 1939, becoming lead inspector in 1924; assistant car foreman in 1926; car foreman in 1928; traveling car inspector in 1929, and general car foreman in 1933. Mr. Carpenter became assistant superintendent of the car department of the D. L. & W. at Scranton in 1939.

Obituary

F. P. Neesley, master mechanic on the Michigan Central at Jackson, Mich., died suddenly at his home in that city on June 12.

George Franklin Hess, who retired on April 18, 1940, as superintendent of motive power of the Wabash, with headquarters at Decatur, Ill., died on June 27 at Martinsville, Ind. He had been in poor health for some time. Mr. Hess was born at Ft. Wayne, Ind., on January 1, 1872, and entered railway service as a messenger boy in the mechanical department of the Pennsylvania in 1886. In March, 1887, he became a machinist apprentice in the Pennsylvania shops at Ft. Wayne, and four years later was appointed a machinist. He later served the Cleveland & Pittsburgh (now part of the Pennsylvania) at Wellsville, Ohio; the Cleveland, Canton & Southern (now part of the Wheeling & Lake Erie) at Canton, Ohio; the Atchison, Topeka & Santa Fe, at Raton, N. M.; the Cleveland, Cincinnati, Chicago & St. Louis (Big Four), at Wabash, Ind.; and the Wabash at Ft. Wayne, Ind. In Sep-

George Franklin Hess

tember, 1897, he was promoted to enginehouse foreman at Montpelier, Ohio, and short time later was transferred to Delray, Mich. In May, 1899, he went with the Grand Trunk Western as general foreman at Detroit, Mich., and later served the Chicago, Rock Island & Pacific as enginehouse foreman at Pratt, Kan., and at Caldwell, Kan. In July, 1902, Mr. Hess was advanced to general foreman of the 47th Street (Chicago) shops, and in March, 1903, he went with the Baltimore & Ohio as erecting foreman at Newark, Ohio. One month later, he was appointed general foreman at South Chicago, and in June, 1903, he was promoted to master mechanic at Lorain, Ohio. In November, 1910, he was transferred to Chillicothe, Ohio, and on August 1, 1911, he was appointed superintendent of machinery of the Kansas City Southern, with headquarters at Pittsburg, Kan. Mr. Hess was appointed superintendent of motive power of the Wabash, with headquarters at Decatur, Ill., on June 1, 1920.


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